TECHNOLOGY DEPT.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV
No. 1421

SATURDAY, SEPTEMBER 21, 1946
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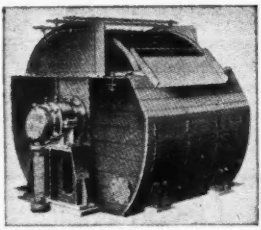

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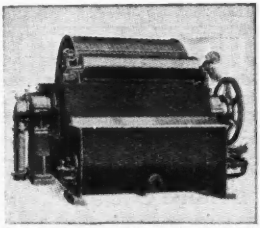

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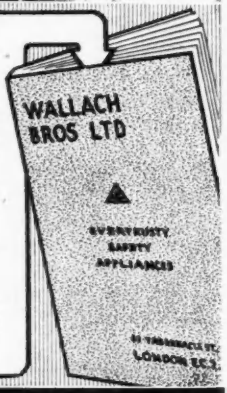

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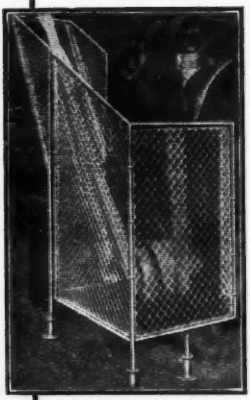

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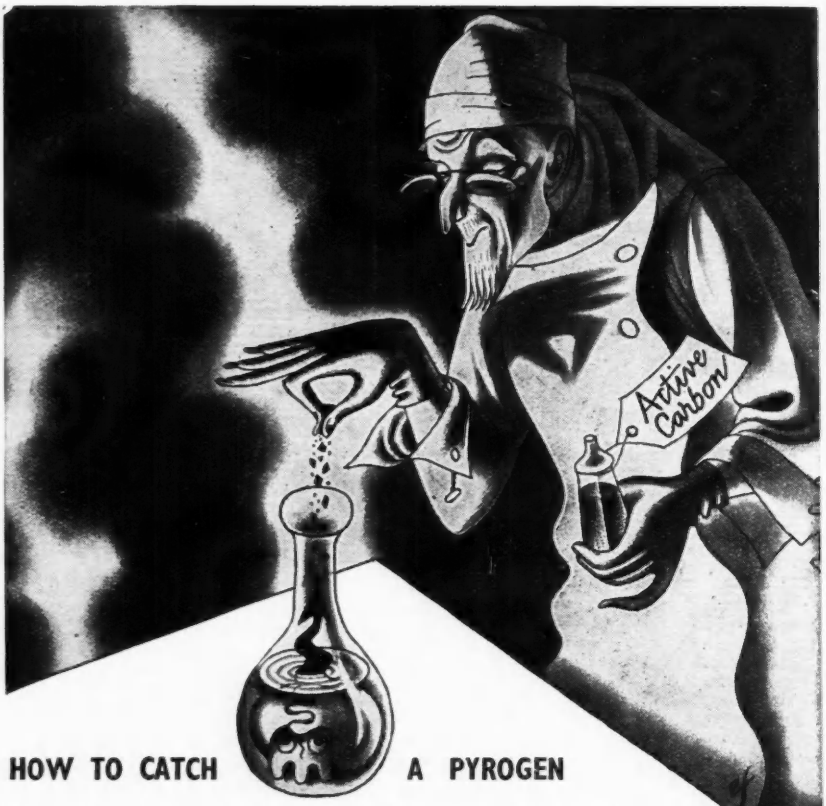

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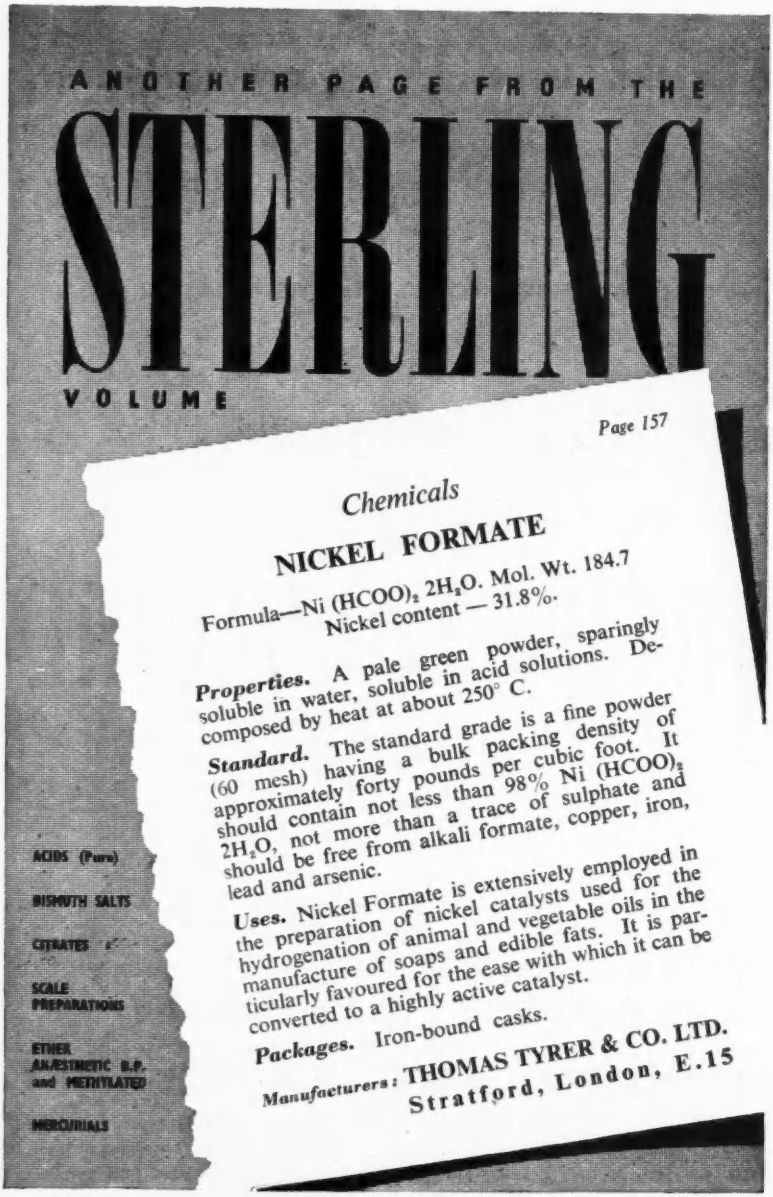
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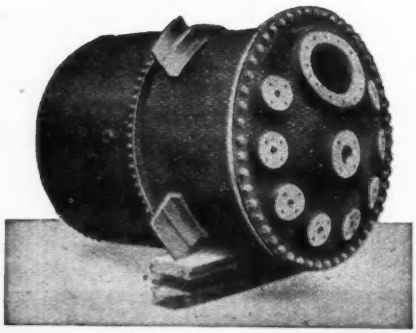

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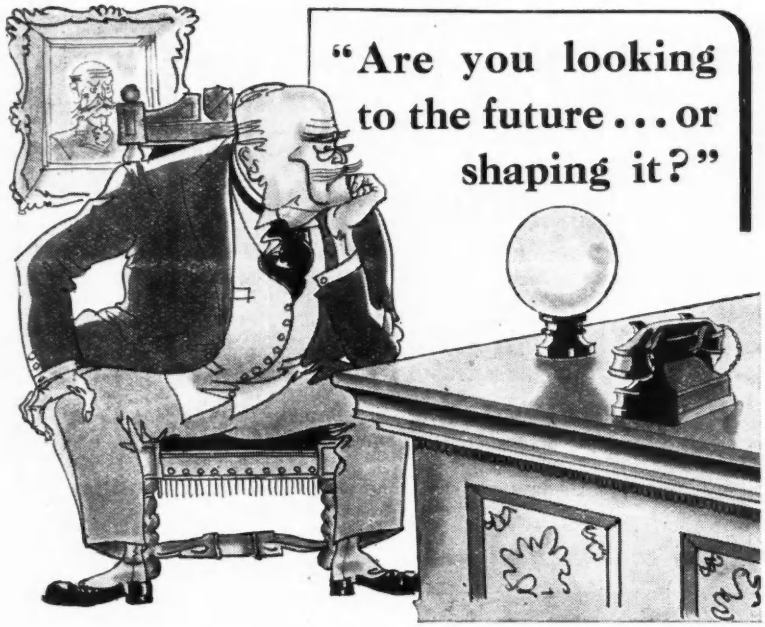

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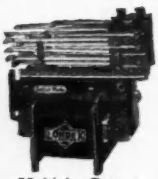

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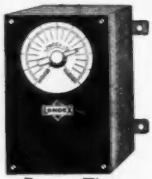

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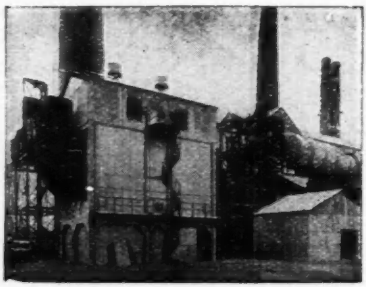

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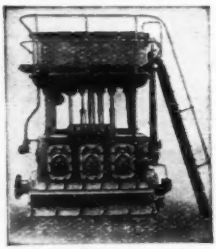

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Accountancy and Technology

THE accountant is a very necessary member of the staff of every large firm. To a small firm he is an essential visitor, a periodic comet who, having inspected us closely, retires into outer space and is no more seen. Accountancy, as an art, must be practised by every firm, for to ignore the monetary aspects of business is to court bankruptcy. The accountant, however, is like fire: a good servant but a bad master. The professional accountant would not agree to that statement. In his view he is the dominant personality in business transactions. It is through his skill, he believes, that costs are known and that the consuming enthusiasm of the technical men is kept within the bounds of sound finance.

There is a tendency in the business world to-day to promote the accountant to the highest positions, while leaving the technologist to hoe his less exalted row, keeping his nose well to the ground. There are many examples of great businesses in which the accountant is supreme, while the technical men are kept in their former places. We should be far from disputing the fact that high technical qualifications do not necessarily make for high administrative powers. Let the best man be promoted to the management and to the Board. But do not let us make the mistake of believing that because a man belongs to a profession that understands finance, he is necessarily a better manager than one who is primarily a technologist. The higher posts must be filled on the basis of personal ability, not according to the profession of the individual.

There is another, and possibly more general, aspect of this inter-relation between the professions. In a firm that is otherwise well-balanced, the management is less often technical in outlook and training, and in consequence, since all firms must operate for profit, the management tends to regard the accountant as the ultimate authority. The accountant is more likely to be called in when the engineer has had his say and has gone his way. It is the accountant who will submit the engineer's statement to what he deems to be the cold light of reason, and on his report the proposal is likely to be accepted or turned down. "Business men," especially those of the genus who live in one particular part of the country, pride themselves upon their hard-headedness. Each wants to know that his venture will "pay"; for this assurance he looks to the accountant.

Quite firmly we hold that this attitude is all

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wrong. In this we are sustained by Dr. Cohoe, this year's Messel Medallist. This is what he said in his Memorial Lecture: "The accountant is handicapped by his ignorance of possibilities. He can review a balance sheet with intelligence and ability, but he may forget that a balance sheet may be ancient history. . . . He is fearful in a fast-moving world of obsolescence, and instead of making a bold decision, retains uneconomic procedures." The limitations of the accountant are quite plain. An admirable and conscientious worker, he is inevitably found to fail in the direction of a business if his outlook is bounded by the methods of his art—or craft, whichever it be. Any attempt to run a business on the basis of last year's accounts is bound to fail for the same reason. It is, quite simply, because the balance-sheet is history, and is therefore static, whereas technology is dynamic. We cannot say with justification that because certain processes made a profit last year, and the year before, they will therefore make a profit next year. Others may have discovered and put into practice better plant and better methods which will enable them to reduce their costs so that the established product which did so well last year will be undercut and rendered unsaleable. The technologist is the man who knows these things. It is from his knowledge that future improvements can be forecast and put into effect. "The technologist," says Dr. Cohoe, "constantly has his eyes on the future. He is seldom satisfied with the *status quo* and he cannot abide obsolete equipment or methods."

Overmuch reliance upon accountancy as the guiding principle in business leads, as Dr. Cohoe has pointed out, to the depth of absurdity when "through the employment of obsolete methods and equipment, production can be maintained and dividends paid only if subsidies in some form be received. When capital allows itself to sink into this position it opens the door by which the proponents of nationalisation may find easy entrance." Tariffs are one form of subsidy. We should not like to suggest that tariffs are never necessary. There may be special advantages which one nation has in regard to accessibility of raw materials, cheap power, or other artificial advantage (including cheap labour), that makes it necessary for tariffs to be imposed to maintain sufficient home trade to keep industry alive. Generally speaking, however, industry should be able to function without tariffs or any other form of subsidy unless it is subject to unfair competition. What is needed is technological progress unhampered by over-insistence upon the financial past as dictating policy. One form of the ultimate absurdity is reached when an obsolete and ill-maintained plant is kept in operation on the ground that since it involves no capital charges, it can operate more cheaply than a new plant working with the highest efficiency. It is a little difficult to detect wherein lies the fallacy of this from an accountancy angle. But a plant obviously becomes obsolete when it is considerably less efficient than other plants turning out the same product.

All this does not mean that accountancy should have no place in the management of business. Very much the reverse. It means that the deductions of accountancy must be qualified by those of technology. Dr. Cohoe foresees "the gradual domination of the technological mind over the accounting habit and attitude." It is difficult to see how an accountant working by himself can even determine accurately the cost of operation. The engineer must be called into collaboration, for there is much that the accountant cannot know about the process he is endeavouring to put under the financial microscope. At the same time, the technologist, in his desire to advance, must "carry some accounting ballast in order that his flights into the realms of constructive imagination do not take him too far above the reality of practical considerations."

A very real difficulty in many businesses is that the engineer or the scientist has to satisfy a non-technical head of the soundness of his plans. If the engineer presents his plan properly, with due regard to the lack of understanding and psychology of those in control, he should get it accepted if it is sound. But Dr. Cohoe evidently finds in America the same difficulties that we find in this country for he says: "Every technologist knows, when a chief executive rejects a presented plan on the grounds that it is 'too theoretical,' that he simply does not know what it is all about. Instead of taxing the executive with ignorance the technologist should, in many cases, blame himself for a faulty presentation."

And there, perhaps, we shall be wise to leave this very debatable subject, lest we also are blamed for being too theoretical.

NOTES AND COMMENTS

The Plastics Position

MORE irresponsible rubbish, we believe, has been written and spoken about plastics than about any other branch of scientific industry—though the production of commercial power from nuclear energy must now be running it pretty close. Consequently, Dr. Yarsley's summing-up of the present position of plastics, and their future prospects, delivered before the International Technical Congress in Paris this week, is doubly welcome—both for its own sake and for the misapprehensions it must help to remove. We make no apology, therefore, for publishing it substantially in full; since, so far as we know, no similarly brief and concise statement of the facts has yet appeared. Some excellent books on plastics have been published, and many admirable articles in the technical Press have dealt with various aspects of the subject; but we believe that this is the first occasion on which users of the multifarious materials included under the head of plastics have had the position put to them *en bloc*. Dr. Yarsley is to be congratulated on his excellent combination of the caution of a scientist with the optimism of a man of vision. An interesting point is his abandonment of the conventional terms "thermosetting" and "thermoplastic" in favour of the more accurate "thermohardening" and "thermosoftening." We wonder which pair will eventually find its way into the established language.

The Written Word

BY the death of Sir James Jeans, science has lost one of her greatest and most lucid exponents. It is not for us to record here his achievements in the sphere of cosmogony and stellar physics, but his lifework embodies a lesson for every scientist, especially for such as seek to communicate the results of their efforts to a non-specialist public. There could hardly be a more abstruse or recalcitrant subject, from the point of view of dissemination to the public, than the branch of science which Jeans made peculiarly his own; yet he contrived to write upon this very subject what was nothing less than a "best-seller." No more striking proof than this could be demanded of the contention (one we are continually making) that it is quite possible to "put science across" to the multitude. What is perhaps even more interesting, in the present instance, is that Jeans did not set out to be a "populariser" of science; he simply had the rare faculty of expressing his ideas in words that could mean something to the man of average intelligence. Naturally, we do not expect every scientific writer to have that faculty in an equal degree; but Jeans is the cardinal example of how much can be done by avoiding professional jargon. It appears that Sir Richard Gregory was the first to call the attention of a wide scientific public to the clarity of Jeans's expression (not the only service of the kind he has performed), but it was the publication of *The Mysterious Universe* in 1930 that brought Jeans a really universal audience; and those who heard his presidential address to the British Association in 1934 realised that that was no isolated example of his powers. It will be long before we meet the equal of Jeans; but his achievement has set a standard of scientific writing which his lesser colleagues in the field of science might well try to approach in their humbler way.

Rare Chemicals

OVER 8500 uncommon compounds, some of them in fractions of a milligram, make up the "stock-in-trade" of the National Registry of Rare Chemicals in the United States, which is directed, free of charge, by the Armour Research Foundation, 35 West 33rd Street, Chicago. In a brief account of the Registry's activities (*Chem. Eng. News*, 1946, *24*, 2173), Frances Knock gives some indication of the services that it has performed during the four years since its foundation on June 1, 1942. Established primarily with the purpose of speeding up war-time activities, the Registry has answered over 8000 inquiries from every continent of the globe, and has satisfactory documentary evidence that these answers have indeed led directly to the successful conclusion of many enterprises which, without them, would have been unduly prolonged or even doomed to failure. All types of chemist have required the information, and the suppliers of the informtion have been equally varied. The Registry does not normally buy or sell chemicals—merely passing on information about where they may be obtained—but, where anonymity is an essential, it will act as commercial intermediary with-

out disclosing the name of the supplier, a valuable service where " trade secrets " may be involved. To trace the sources of certain chemicals, the staff of the Registry searched the literature of the last ten years for likely suppliers, and these researches were often rewarded with success. The information required includes the full chemical name of the compound, the position of any substituents, and the approximate amount available, with data on purity where possible. Release of this information in no way obliges the possessor of the chemical to dispose of it, though it is generally assumed that a release of some of the compound is contemplated, if suitable terms can be arranged. The Registry envisages even greater service to the world of research. Is it chimerical to suggest, now that the time-dimension of the world is so rapidly shrinking, that it might change its name to " International Registry of Rare Chemicals?"

U.S. Research

MORE money than ever before is now being spent on research projects in the United States, the latest estimate of the annual expenditure in this direction being put at $500,000,000. Even more interesting is the statement that the chemical, pharmaceutical, and petroleum industries are leading in the volume of research. One striking development in connection with post-war chemical research in the U.S. is the great increase that has taken place in the amount of work " farmed out " by industrial concerns to private research organisations. Most of this type of research work is being undertaken on behalf of companies which have neither laboratory facilities nor a scientific staff, but even industrial concerns with extensive research facilities of their own are making use of private research. This trend is largely due to the fact that the outside research group offers many inducements for special investigations which can be carried out without interruption in an organisation separated from production operations.

Science is Power

THE general expansion now taking place in chemical and allied research, together with the rapidly increasing membership of the American Chemical Society, lends added significance to the Society's slogan: " Science is Power." The Society now has a membership of more than 47,000, which is an increase of over 5000 on the figure of a year ago. At the Society's 110th national meeting, held at the beginning of this month, no fewer than 726 papers were presented. This is the largest number ever read at a meeting of the Society and they dealt with advances in 17 branches of chemical science and technology. The contributions of chemists in the world-wide war against hunger, recent discoveries concerning the potentialities of radioactivity, and the war-time harnessing of the unruly gas, fluorine, opening up a vast field to industry, were among the triumphs reported, and progress in the fields of insecticides, plastics, and synthetic rubber were also described.

Wholesale Prices in August

IN contrast with the violent movement reported in July, the alterations in wholesale prices, so far as chemical and metallurgical materials were concerned, were comparatively slight, as recorded by the Board of Trade, although a rise of 2.2 per cent. in the index figure for iron and stell was the steepest ascent which those commodities have experienced since January, bringing the figure from 206.4 up to 211.1 (1930 = 100). Various groups in this sector were affected, the greatest rise being about 17 per cent. in the f.o.b. price of tinplate. Manufactured iron prices were freed from control on August 14, with resultant increases of between 5½ and 7 per cent. Non-ferrous metals, with an increase of only 0.1 per cent. (from 161.2 to 161.4), were much less disturbed in price than during the previous monthly period, a slight increase in lead pipes and sheets being the only one recorded. Among " chemicals and oils," the slow but steady rise, which has persevered without a break during the year, continued unchecked, the index figure going up from 147.8 to 148.2 (0.3 per cent.). The average price of soap increased by about 1½ per cent., as a result of the advance in July; the only notable increase that took place actually in August was a 5 per cent. advance in the price of chalk lime, which is " weighted " in the table at the figure of 0.5 per cent.

A world conference on mineral resources will be held in connection with the 75th anniversary celebrations of the American Institute of Mining and Metallurgical Engineers in New York during the third week of March, 1947.

Plastics

The Modern Materials of Construction*

by V. E. YARSLEY, D.Sc., M.Sc., F.R.I.C.

Dr. V. E. Yarsley

ALTHOUGH the pioneer plastic, celluloid, is now almost 70 years old, most of the materials and processes which form the basis of the modern plastics industries have been developed during the past 25 years. To-day, with certain notable exceptions, we regard as plastics those organic materials which, although they are rigid solids in their finished state, are at some stage in their production capable of flow, and can be caused to take up a desired shape under the action singly or together of heat and pressure. The raw plastics are largely the products of chemical synthesis, prepared from simple raw materials which are widely distributed over the surface of the earth. It follows, therefore, that the plastics industries are in general terms "footloose," and can be established at will in the world where necessity or economy dictates. The raw plastics are available to industry in the form of sheets, rods, or tubes, in powder or liquid form, and can in some instances be worked and applied by methods long since developed for conventional constructional materials.

I do not propose to worry you with the chemical nature of the plastic materials. These belong to between 30 and 40 different chemical types, but they can be broadly and more simply grouped under two headings. These are the thermosoftening group which, up to the point of chemical decomposition, are continuously heat-sensitive, and include the pioneers celluloid and cellulose acetate, and also the later synthetics such as the vinyl, styrene, methacrylate, and ethylene polymers. The second group includes the materials which when once heated to a specified degree, or "cured" as we say in the industry, are thereafter insensitive to moderate heat. These are the thermohardening plastics which include those of the bakelite and aminoplastic families, and the more recently developed allyl polymers.

Four Groups

The plastics industries proper can be broadly divided into four groups: (1) the manufacturers of the raw plastics in the form of sheets, rods, tubes, powders, and syrups; (2) the moulders, who take the powders and by processes of compression, injection or transfer moulding or by extrusion, form these plastics into the finished products of a thousand uses; (3) the fabricators, who manipulate the sheets, rods, and tubes, by processes which are broadly analogous to those long since applied to metals; and (4) the laminators, who impregnate fibrous reinforcing materials such as paper and fabrics of all types with plastic bonding agents, producing therefore yet another series of sheets, rods, and tubes of considerable strength yet low density, which again are applied much as are their metal counterparts. This group has extended and, indeed, revolutionised the industry which has long passed under the designation of "plywood," and this to such good purpose that materials of this type were mainly used in the construction of the "Mosquito" plane of war-time fame.

Closely related to these groups which constitute the plastics industry proper, are those which use plastics as their raw materials, mainly in solution form. These include the manufacturers of certain types of rayon and transparent films, also the producers of surface coatings, adhesives and cements. It is of interest to note in passing that surface coatings for furniture, motor cars, etc., absorb a greater tonnage of synthetic plastics than does the moulding industry itself. This branch of the industry also extends to the treatment of fabrics to render them waterproof or crease-resistant.

The idea is widespread, but entirely mistaken, that plastics are the basis of huge industries throughout the world. Most certainly they are used as ancillary raw materials by an ever-increasing number of industries, so much so that it is becoming increasingly difficult to say where the plastics industries actually start and finish. Even swollen by war demands, it is doubtful if world production of plastics proper (that is excluding the so-called synthetic rubbers) exceeds the million-ton mark per annum. Unfortunately, very few production or other reliable statistics are available outside America, but according to

* Slightly abridged from the paper presented by Dr. Yarsley to the International Technical Congress, Paris, September 16–21, 1946.

statistics published early this year by the Society of Plastics Industry in New York, the American plastics industry employs about 85,000 persons, and in 1944 produced 450,000 tons of material with a dollar valuation approximating to 500 million. For many years America has had the lion's share of production in plastics, followed by Great Britain and the Empire Countries, Germany, France, Russia, and Japan. How far production in the future will be confined to the countries of the United Nations, or to what extent the vast natural resources of South America and India will be explored for the expansion of world plastics, remains to be seen.

The Significance of Plastics

To appreciate the full significance of plastics and to appraise the impact of these new materials on world industry, we must trace briefly the rise of these new industries during the present century, and in particular examine the changes in outlook which have been the consequence.

The production of some of the pioneer plastics was prompted by a desire to find suitable alternatives to some of the rarer natural materials. Thus the search for an alternative to ivory for the production of billiard balls inspired the discovery of celluloid, while the desire to reduce the fire risk on this new material resulted in the development of cellulose acetate plastic, earlier known as "non-inflammable" celluloid. The desire to produce a resinous material alternative to shellac and other natural products prompted the early work of Baekeland. This latter success was far more momentous than was at the time appreciated. Up to this time the classical outlook on organic chemistry, which since Wöhler's synthesis in 1828, had persisted with the recognition, as useful products, of only the defined crystalline or liquid compounds. Baekeland's changed outlook, which enabled him to evaluate the ill-defined resinous masses, was as epoch-making in the history of organic chemistry as had been Wöhler's original urea synthesis. The old concept of precise molecular chemistry faded away and gave place to the organic chemistry of undefined molecules, the chemistry of large molecules and long chains, structures long recognised in nature yet hitherto not copied by man. Thus were laid the foundations of large molecular chemistry, which we now know under its modern name high-polymer chemistry, and the foundations of those industries which we to-day designate as plastics.

The first phase in the development of the modern plastics industries followed rapidly on Baekeland's pioneer work, and in rapid succession came a large number of products of many different chemical types both thermohardening and thermosoftening. During this period we find almost always the same incentive, the desire to produce a material, followed by efforts to find an application for it in industry. Such a method of approach was inevitably hit-and-miss, and while it produced some satisfactory results it was responsible also for some dismal failures. As always, the failures were most observed by those industries and the using public who had suffered. Naturally also these man-made materials were applied in many instances to purposes for which natural products had formerly functioned. Thus it came about that, with failures in mind, the public was biassed against what they termed "substitute" materials.

Nevertheless, in spite of early failures, the new materials recorded many successes, and as the new plastics industries became established, they had time to devote to the consolidation of their position in the general body of industry. Progress in this direction was increased by yet another fundamental change in attitude. The successes which synthetic chemistry had attained in other fields—notably dyestuffs and pharmaceuticals—had shown the possibility of "tailor-made" molecules, so that chemists approached the problem from the user end, building up a product having a structure calculated to give the desired properties. The outstanding example of this changed approach is the success which attended the synthesis of nylon by Carothers and his co-workers in the Du Pont laboratories, which must surely rank for all time among the epic pieces of long-term planned research. With the chemists and physicists carefully building up their long-chain polymers having predetermined architecture, and the engineers perfecting methods and plant for working them, the new plastics industries advanced through this first phase of development. In spite of much spectacular progress, industry, as much as the average man-in-the-street, remained sceptical of the new materials, and ultimate progress might have remained slow but for the advent of World War II.

First Real Chance

The shortage of the conventional materials of construction occasioned by the last war gave plastics their real chance, although it must be appreciated that this was their first real production crisis. As in most other branches of advancing technology, war-time development in plastics was intensified in all the belligerent countries to the utmost limits of staff, plant, and raw materials. We are as yet too near these events to be able accurately to assess the progress we have made, and many developments are still on the secret list. It is fairly certain, however, that not only in terms of technological development, but probably even more so in the receptivity of

the other industries to the use of the new materials, plastics progressed several decades during the war years. I stress the importance of the latter, more psychological, progress, because this represented a changed attitude of the user towards plastics, without which few substantial advances could have been achieved. Risks which private enterprise could never have taken both in the production of new materials and in their ultimate use, were taken on behalf of the State when the national need called for it. When natural rubber went out with the fall of Pearl Harbour, plant to produce a million tons of synthetic rubber-like plastics was quickly forthcoming.

Thus, as I have already suggested, we stand at the end of World War II, at the end of the first phase in the development of the plastics industries. From the present-day high peak of technological achievement we view what may be a truly remarkable future for mankind, provided only that the sociological can be made to keep pace with the technological progress.

Plastics Applied

It is no part of the present survey to detail applications of plastics in the various fields of engineering, but I feel that it may be helpful to review their possibilities for usefulness in general terms. Of the outstanding advantages offered by plastics, low density is possibly among the most attractive to the engineer. A range from 0.95 for polythene to 1.7 for polyvinylidene chloride offers many possibilities against metals, if backed by ancillary properties. On the other hand, tensile strengths of 2000 lb./sq. in. for polythene up to 20,000 lb./sq. in. for rolled nylon, or 30,000-50,000 lb./sq. in. for special laminates may not be very impressive in a comparative table. These and other constants such as compressive strength, Young's Modulus, and impact strength may deter the engineer from using plastics in his structures. What the engineer must consider is not how far short in mechanical properties is a particular plastic compared with steel or aluminium, but has the plastic the necessary properties for those special key applications which can carry its cost. It is of little consequence that plastics have not the required mechanical strength to enable them to be used in rebuilding the Eiffel Tower, should this be necessary, for the simple reason that it would be a profligate waste of plastics to consider any such application.

Again by comparison with metals, the thermal properties of plastics are restrictive of their indiscriminate application. Most plastics function reasonably down to −40°C., while nylon, with a melting point above 250°C., can be used safely up to 200°C. Standard thermohardening mouldings and laminates are serviceable at 140-160°C. The coefficients of linear expansion of plastics are generally higher than those of commercial metals.

It has been suggested, with a certain degree of truth, that apart from cutting edges and units which have to withstand direct heat, plastics could meet all the material needs of mankind. Whether this can be done economically is entirely another question. Nevertheless the engineer has in plastics a range of constructional materials of wide possibilities, but certain definite limitations. Broadly speaking we can sum up plastics by saying that they offer the strength of some metals with the lightness of wood. They are poor conductors of heat and electricity, and are in the main reasonably resistant to the action of moisture and agents which the engineer has come to regard as corrosive. Among one or other of the chemical types of plastic it is possible to obtain, within reason, from either plastics alone or allied with other materials, almost any desired physical and mechanical property, except resistance to substantial heat, and even this is being remedied to some extent in those plastics in which the element silicon replaces partially the customary carbon.

One of the fundamental limitations of plastics is their relatively high cost, and even though production is stepped up considerably, as it certainly will in the next few years, we cannot expect plastics to compete on a cost basis with the conventional materials of construction. Thus except for purposes where their special properties are required, plastics will not compete to the exclusion of bricks and mortar, iron and steel, wood and glass. Rather shall we expect to find plastics co-functioning with these materials to improve existing methods of construction.

Scarcity of Raw Materials

Another limitation is the relative scarcity of the raw materials for plastics. Albeit these, such as cellulose, are widely distributed over the earth's surface, to put them in a form in which the plastics industry can take them is a major chemical operation. That wholesale extensions of chemical plant are possible has been shown many times during the war, and one has only to take the synthetic rubber programme in America as an example: nevertheless, to step up chemical synthesis to the point where plastics could start to compete seriously with metals would be an economic impossibility. There is, in fact, a total absence of any justified need for the wholesale substitution of plastics for conventional materials in in what one may term the major industrial applications. The rôle of plastics can still be sufficiently important in collaboration with conventional metals, woods, and ceramics, to bring about a mild revolution in

engineering construction in the next decade. One has only to look to electrical engineering for confirmation of this point; here the introduction of the superior plastics insulating materials has made possible designs and indeed types of machines which would have been impossible a decade ago. The introduction of plastics to combat the ravages of corrosion, to take another isolated example, has again opened up new possibilities for construction, and at the same time increased the efficiency of machines while lowering their running costs substantially.

Assisting the Engineer

Quite apart from the use of plastics in the many fields of engineering construction, there is one application to which I would make reference in which plastics—more particularly transparent plastics—will aid the engineer, and that is the production of scale models. When he had to take unskilled labour into his shipyards, Henry Kaiser used models of his ships in transparent plastic for demonstration purposes. An operative who could not read a blueprint could nevertheless see where his unit fitted into the main structure. Such models have further possibilities in the production of unconventional load-bearing structures. Strains applied to models in transparent celluloid sheet will develop stresses which can be located by the use of Polaroid viewers.

The use of plastics as protective and decorative coatings for metals, woods, and fabrics is too well known to need further mention, but special attention may be drawn to recent developments in the methods of applying the layers of protective plastic. Conventionally plastics have been applied in solution form, a technique which developed with the so-called synthetic lacquers for motor cars in the early 1920's. The spraying of the plastic dissolved in a volatile solvent, while quite satisfactory for some purposes, cannot be universally applied, and indeed this method is inapplicable to certain plastics, which are either insoluble or almost so in commercial solvents. This difficulty has been overcome by the flame-spraying of plastic, in a special gun, which was devised and perfected for the spraying of metal powder. The plastic in finely powdered form is projected at high speed through a controlled blowpipe flame directly on to the surface to be coated, the individual particles then being melted and caused to flow into a uniform layer by further application of the blowpipe flame suitably modified. This method of spraying has made possible the uniform coating of difficult or irregular surfaces, also the application of plastics such as certain thioplasts, which have hitherto been regarded as beyond the range of materials normally available for surface coating.

The use of plastic materials as bonding agents and cements is one which has received considerable stimulus from the exacting war-time demands. Not only have the so-called "synthetics" replaced many of the conventional water-soluble bonding agents, but they have actually competed successfully with soft solders for specific purposes. Many proprietary brands of plastic cement are now available which will give efficient metal/metal seals, under specific conditions. The possibilities of this development are at once apparent, but it must not be taken as implying the widespread use of plastics to the exclusion of rivets or brazing. Many of the plastic bonding agents used are thermosoftening, so that the temperature limits of their application are very definite. Within these limits, however, there are many possibilities, such as the sealing of extruded aluminium tube in the production of cycle frames, or the bonding of T-section aluminium rod in the fabrication of window frames. The plastic bond is speedy in operation, and since it is effected in the cold, it has obvious advantages in comparison with welding. Admittedly, the development of the metal/metal plastic bond is in its infancy, but enough has been done to convince the most sceptical of its ultimate possibilities.

Plastics and the Future

As we look around on the many difficulties which face the statesmen of the world, we realise that it would be a truly brave man who would attempt to prophesy the future of any particular branch of industry. As scientists we confine our attentions to scientific fact, and we can only draw conclusions as to possibilities on the assumption that world order can be established in line with the hopes so fervently expressed in the various war-time manifestos. To this end let us take stock of our position as far as plastics are concerned, at the opening of what I would suggest is the second phase in the development of these new industries, their advent at adult status. In evaluating the future possibilities of plastics we are concerned not only with fundamental principles but also with psychological considerations, and it is under this latter heading that I would make a final suggestion to the engineers who apply the new materials in the service of man. I have already stressed that it was the changed viewpoint on the part of the organic chemists which made plastics possible in the first place. Just as assuredly would I suggest that a change in the approach of the engineers who apply plastics can alone ensure that they attain the maximum possible success in service. Engineers, with their long experience of conventional materials, must realise that in plastics they have something unique, and

not just substitutes for materials long since known. This change in attitude has been necessary in other industries such as the man-made fibres, where progress was slow as long as these were looked on as artificial silk. When they were recognised as "rayon," something quite distinct as natural fibres, both in their processing and use, real progress became possible.

So with plastics, the engineer who applies them must be aware of the key rôle he has to play. Not only must he be careful in his selection of the materials, but he must be more than ever design-conscious. Plastics cannot be applied by mere analogy with metals. The engineer must design not only in plastics but for plastics. On this important question of design I would like to dwell at greater length if time permitted. Suffice it to say that many of the early setbacks which plastics encountered can be traced either to the wrong application of materials, or to mistaken ideas of design. Bitter experience has demonstrated the impossibility of producing plastic units on lines parallel to metal prototypes. Not only must full attention be paid to the varied properties in use of metals and plastics, but due consideration must be given to the conditions of processing which are applied to the plastics. That is why I postulate that it is of fundamental importance for design plastics as well as in plastics.

Use of Colour

Equally important in this connection is the question of the correct use of colour in design of plastics. Unique among constructional materials, plastics offer colour possibilities, ranging in certain types from complete transparency through every possible colour value which chemical synthesis has made possible. Plastics can also be metal-filled or coated with metal, while the properties of certain transparent plastics make it possible to "pipe" light through them to give remarkable luminous and fluorescent effects. In plastics, therefore, designers have possibilities of combining colour and form as never before with constructional materials.

I would like to conclude these remarks by expressing at this international gathering the fervent hope that these materials, which have been made possible by the collaborative effort of men of many nations, may in the not too distant future have an opportunity to make their special contribution towards the establishment of a world of peace and plenty.

"The Triumph of Synthetic Rubber" is one of a series of radio talks reprinted in *From the Research Laboratory to the Armed Forces*, free copies of which are obtainable from the Mellon Institute, Pittsburgh, Pa.

Industrial Chemicals

Courses at the Cass Institute

THREE courses of lectures, of interest to industrial chemists, have been arranged by the Sir John Cass Technical Institute, Jewry Street, London, E.C.3. Two of them are in the special province of the Department of Chemistry, the third is of more general interest. Applications for enrolment should be made to the Principal of the Institute *before* the opening date of the course, if possible.

On Fridays at 6 p.m., beginning on October 11, there will be a course of 20 lectures on *Some Materials of Construction and Some Fundamental Operations*. Lecturers will be distinguished chemists and chemical engineers, the great majority actually engaged in the industry—such firms as the United Steel Companies, Haughtons Patent Metallic Packing, Thermal Syndicate, Hathernware, Mond Nickel, A.P.V., Kestner, and Johnson Matthey being represented in the constructional section, and others of equal reputation in the operational section. The fee for the course is 30s.

An advanced course of 19 lectures (fee for the course 30s.) on *The Chemistry and Utilisation of the Less Familiar Elements* will be held on Wednesdays at 6 p.m., starting on October 16. Here the lecturers are drawn from Johnson Matthey, Murex, and Thorium, Ltd. Apart from general chemistry, the spectrography of the rare earths will be covered; also the analytical chemistry of the platinum metals.

The third course, on Industrial Law, will consist of 12 lectures by Mr. Eric Walker, B.A., B.C.L., of Grays Inn, and is addressed to men and women in executive and administrative positions in industry. The lectures will be held on Tuesdays at 6 p.m., starting on October 1, and will cover contracts, rights, relations between employer and employee, patents, trade marks, etc. The fee for the course is 10s.

Each lecture will last from 1¼ to 1½ hr.

IRON AND STEEL OUTPUT

Figures issued by the Ministry of Supply (Iron and Steel Control) show that there was an increase in the U.K. production of pig-iron and steel during August. The weekly average production of pig-iron was 145,300 tons, equal to an annual rate of 7,558,000 tons, as compared with 122,300 tons for August, 1945, equal to an annual rate of 6,358,000 tons. The production of steel ingots and castings was at the weekly average rate of 225,900 tons, equal to an annual rate of 11,747,000 tons, as compared with 182,000 for August last year, equal to an annual rate of 9,465,000 tons.

LETTER TO THE EDITOR

B.A.C. and T.U.C.

SIR,—I am very interested to note that "Non-Socialist Chemist" was one of the original members of the B.A.C., a privilege which I share with him. On looking back, however, I feel that the enthusiasm to which he refers would be better described as furious indignation because we were paid just about half as much as the plumbers who constructed and maintained the plant which we designed and operated.

The universal expressions of dissatisfaction did secure increased remuneration in 1918, but as soon as the chemists received as much as the plumbers they seemed to be satisfied and it took about eight years to enrol the next 200 members. May I invite your correspondent to write to me and tell me what he thinks the B.A.C. should do and to offer his assistance in achieving his objects?

For the benefit of those who are not members may I explain that the huge funds provide a substantial backing for an unemployment benefit fund, from which an unemployed chemist can draw up to £6 5s. per week. It is the admiration of all who run such schemes. Even to-day chemists are unemployed and draw benefit. We are considering extending the scheme to cover unemployment through ill health and hope to be able to provide an income for those who become totally incapacitated and can never again work. Unfortunately we have such members. We are working on a plan to provide for a transferable superannuation scheme. Many members derive financial benefit from other schemes which more than pay for their subscription. At least 10,000 chemists could join and follow their example. We have other plans which could be speeded up if more of our members would do some work for the Association. The "dwindling membership" consists of the removal of the names of those who have not paid subscriptions for many years and who in most cases cannot be traced. Many associations continue to count them in order to swell the membership figures.

"Non-Socialist Chemist" has taken up nearly two columns of your paper in complaining about sloth and torpor, but there is not a single word to indicate what he thinks we ought to do. We await his bright ideas and his effective leadership.—Yours faithfully,

NORMAN SHELDON,

London, W.1. September 16.

The Thermal Syndicate, Ltd., has issued a new price list of Vitreosil pure fused silico tubing. Copies of this are obtainable from the head office, Wallsend, Northumberland.

Paint Chemists' Prize

Memorial to the late F. W. Clark

TO commemorate the late Francis William Clark, of the Distillers Co., Ltd., and long associated with British Industrial Solvents, Ltd., the "F. W. Clark Memorial Prize" has been founded by the Oil and Colour Chemists' Association. F. W. Clark was the "English chemist" who was reported as among the "missing" in 1942 when the ship on which he was sailing to America, on an important business mission, failed to reach its destination.

The sum of £250 collected to form a memorial has been handed to the O.C.C.A., whose Technical Education Committee has now formulated a prize scheme for the encouragement of students—a subject in which F. W. Clark was always interested. It is now announced that the prize shall be awarded annually for the best essay (1000-5000 words) dealing with any subject (chosen by the candidate) with which the O.C.C.A. is concerned. The prize is to consist of books, instruments, or other gift of value to the candidate in the pursuit of knowledge and experience in his industry. Candidates must not have reached their 21st birthday on the last date by which papers must be received by the Secretary of the Association—in the present instance, April 30, 1947. The winning paper shall become the property of the Association; presentation of the award may be made either at the annual general meeting or the annual dinner of the O.C.C.A.

Awards to Inventors

Royal Commission's Pamphlet

THE Royal Commission on Awards to Inventors has issued a pamphlet containing the relevant part of its "terms of reference," the rules regulating the procedure before the Commission, and general instructions for the guidance of intending claimants before the Commission (H.M.S.O. price 2d.). The Commission will not begin its public hearings of claims before November 12 and a further announcement of the times and dates of sittings will be made in due course. Details of cases to be heard will be published in the Daily Cause list. While in no way bound by the rulings and decisions of the similar Royal Commission set up in 1919, the present Commission will in general have regard to the priniciples and policy adopted by that Commission. Communications intended for the Commission should be addressed to the Secretary, Royal Commission on Awards to Inventors, Somerset House, Strand, London, W.C.2.

Dunlop's New Factory

Conversion from War to Peace at Speke

WHAT is believed to be the first example of rubber processing and manufacture proceeding in one straight flow line throughout a factory is to be seen at the Speke (Liverpool) factory of the Dunlop Rubber Co., Ltd. Built originally as a Government "shadow" factory on a site of 101 acres, not far from Speke Airport, the factory was occupied throughout the war by Rootes Securities, Ltd., who built nearly 5000 aircraft there.

The Dunlop Company did not take it over officially until August 1, 1945, and although many conversion difficulties had to be overcome, the factory is already providing employment for more than 4000 people, who are turning out rubber tyres, footwear, golf and tennis balls, and other equipment in ever-increasing quantities. When the installation of new plant has been completed, it is expected that there will be regular employment for between 6000 and 7000 people.

The factory, which covers 1,400,000 sq. ft., was the first of the war-time factories to be allocated by the Government for peace-time production, and V2's were still dropping around the Dunlop head offices when the conversion project was mooted. The decision to convert the factory to rubber processing and the manufacture of rubber products was not an easy one to take, as an initial survey disclosed at once that the main supply services then available—electric power, water supply, and steam-raising plant—were far below the requirements of a rubber factory. There was, in fact, no steam supply, as the boiler house was installed only for water heating. On the other hand, the height and span of the main building were satisfactory, and the design of the factory generally was attractive.

Foundations

In rubber processing, very heavy machinery is employed in such early operations as mixing, calendering, and extruding, and careful consideration had to be given to the provision of suitable foundations. Altogether, the major equipment weighs 5000 tons; the electrical plant 600 tons; and the engineering services plant, including drives, etc., but excluding piping and mains, 500 tons. Fortunately, the factory is on good clay, and this was an advantage, little or no shuttering being required for the very deep foundations and for the autoclave pits at the other end of the production line. There are 58 heavy foundations, which, together with their service trenches, required 20,610 cu. yds. of excavations and 9611 cu. yds. of concrete. Two autoclave pits alone required the excavating of 2270 cu. yds., and nine internal mixer bases required the excavating of 1188 cu. yds.

A modern rubber-mixing mill consists of internal mixing machines discharging by gravity to the sheeting mills below, and such plant requires a high building. In this case it was considered necessary to have minimum headroom of 30 ft., plus space above for a 15-ton crane, and as the north end of the main building had such height it thus determined the location of the mixing mills, and, in turn, the direction of flow of the operations, this, incidentally, being the reverse of the flow when the factory was producing aircraft.

This north-to-south flow of operations also enabled the curing or vulcanising to be brought close to the steam generation or boiler house; moreover, it determined the position of the newly-constructed pump room, so that the distance from the generation of a particular service to the consumption of that service was brought to the irreducible minimum.

Mixing Operations

Special consideration had to be given to the mixing operations, notably the means for delivering and weighing gas and lamp-black powders for the internal mixers. Here, cleanliness to the worker and the shop was regarded as an essential. This has been most successfully accomplished by the use of a special conveyor system in conjunction with a novel method of automatic weighing and dust collection, designed and developed by Dunlop engineers.

Several other novel features are to be observed in the mixing section, including a centralised control room, where the operations and process conditions of the mixing machines are observed and recorded; automatic sheeting and cooling conveyors for the rubber stock and a pneumatic system for conveying samples of the stock to and from the control laboratory room for each batch to be completely analysed before further processing. The mixings required for all manufactured products are carried out in this section.

For tyre manufacture the lay-out follows a directional flow of operations passing through the following operations: fabric calendering; tread extruding; component part manufacture; tyre building; tyre shaping; moulding and vulcanising; and finishing—inspection and despatch. A large part of the manufacturing floor space is allocated to the manufacture of rubber footwear, which is also laid out in progressional flow

from the delivery of the mixed rubber and processed fabric to vulcanising, where specially designed transporters are provided for loading and unloading the large-diameter vulcanisers. The equipment for the manufacture of golf and tennis balls has been installed in an enclosed area previously used for the spray painting of aircraft. The lofty "flight shed" has been allocated for conveyor belting production as the very large presses required for this work include heavy cranes, with plenty of headroom for the movement of the belts from the making sections to the curing sections.

Water-circulating System

An interesting feature of the process water-circulating system is that the greatest possible cooling capacity is taken from the water by re-circulation through the various processes at least three times. Such an arrangement allows for the primary water supply at the lowest temperature to be used on the more vital processes where cooling of the stock is an important feature. After the water has been used on this first circuit of the system, it is returned by gravity to a collecting sump and pumped back to the second water tank or sump and re-circulated through the less vital cooling processes. This operation is repeated for the third circulating system, and the water is then used either for flushing purposes or run to waste as its temperature by that time has reached a point where it is of no further use for cooling.

This system utilises the maximum cooling capacity of the water, and in doing so keeps to a minimum the initial quantity of water required from the two bore-wells. The total pumping capacity to achieve this is more than three times that for the initial water supply and is, in fact, of the order of 620,000 gals. per hour.

What has been written is sufficient, perhaps, to indicate the magnitude of the task involved in the change-over. That it has so far been accomplished is due to the good work of the staff, and to the help and co-operation of the engineering suppliers.

A selected party of technical Press representatives, including one from THE CHEMICAL AGE, was taken on a conducted tour of the factory on Wednesday last week. They were received on arrival by Mr. G. E. Beharrell, managing director of the Dunlop Rubber Co., Ltd., who was accompanied by Mr. A. Healey, director of production; Mr. H. Willshaw, O.B.E., chief engineer, rubber factories; Mr. D. B. Collett, general works manager at Speke; and Mr. D. Crabbe, chief engineer at Speke.

Mr. Beharrell presided at luncheon, when the principal guests were the Lord Mayor of Liverpool, Alderman Luke Hogan, with whom was the Lady Mayoress; and Sir Philip Warter, Controller-General, Factory and Storage Premises, Board of Trade. Proposing the health of the Lord Mayor and the future prosperity of the City of Liverpool, Mr. Beharrell dealt with the reasons for the decision to establish the factory at Speke, and spoke appreciatively of the ready co-operation received from the civic authorities and the major suppliers of equipment, etc. He said they had had encouraging results in the training of labour in new and strange work and looked forward with confidence to a steady increase in employment and production, although the supply of raw materials, other than rubber, continued to cause some anxiety. In his reply, the Lord Mayor said he shuddered to think what the Liverpool unemployment position would have been if the Dunlop Company had not taken the Speke factory. He was very pleased to find that 50 per cent. of the employees were men.

The health of Sir Philip Warter was proposed by Mr. A. Healey, who said the taking over of the factory was a big adventure, but the company felt sure of success. They greatly appreciated the help received from Sir Philip and the Board of Trade generally. Sir Philip suitably replied, remarking that he was grateful to Dunlop's for taking over what at first sight appeared to be a "white elephant" from the point of view of the structure of the factory.

Mr. E. H. Hurlston, technical superintendent, is in charge of the central laboratory, and he is assisted by Mr. W. A. Clarke, physicist; Mr. H. C. Guthrie, chemist; and Mr. H. J. Walters, in charge of processing.

French Chemical Finance

Company's New Shares

THE well-known French chemical company, Etablissements Kuhlmann, is issuing one new share for each share already held. Last year the company launched a Frs.250,000,000 3½ per cent. bond loan and obtained acceptance credits up to Frs.400,000,000 from the Crédit National, the State bank for financing reconstruction.

The purpose of the new appeal is to replenish working funds in view of the continuous rise of prices. For 1945, Kuhlmann recorded an operating loss amounting to Frs.70,000,000, which was offset by extraordinary profits resulting from the devaluation of the franc. During the occupation it became the second chief shareholder in Francolor, which was established by the Germans to control the entire French dyeing industry. Kuhlmann now shares control of Francolor with the French Government since the latter seized holdings held by I.G. Farben.

SOME OF THE PLANT IN THE NEW DUNLOP FACTORY

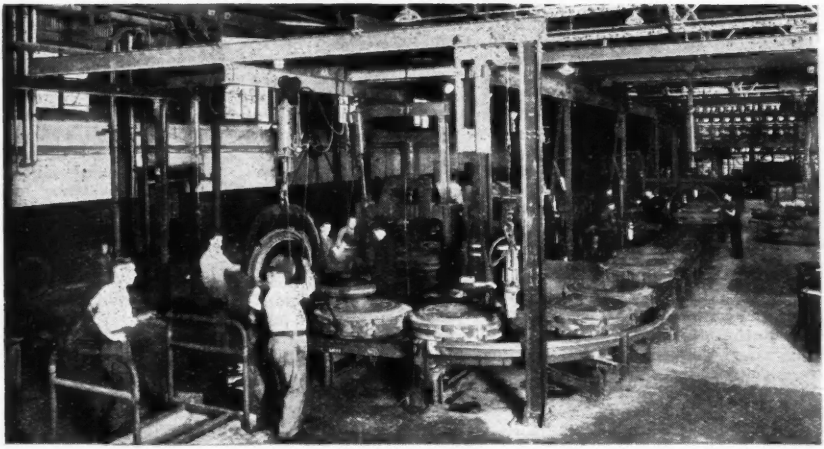
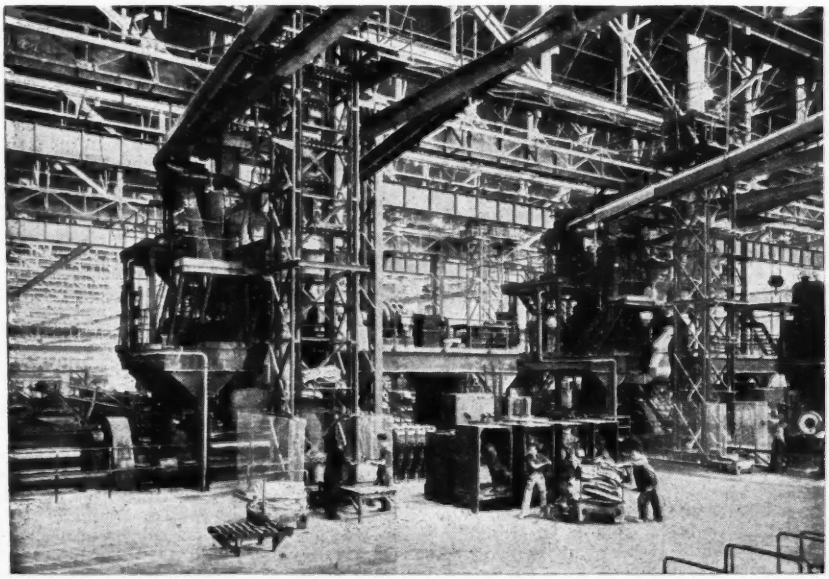


Fig. 1. (above). The giant tyre moulding plant in the new Dunlop factory at Speke, showing the autoclaves in the centre. Fig. 2 (below). Part of the rubber mixing and handling equipment. Carbon black is unloaded in an enclosed room and taken by a system of conveyors (seen at the top of the picture) to a weighing device above the mixer. A known quantity is then discharged into the mixer. It is possible to feed two varieties of carbon black to each mixer.



Metallurgists and Atomic Energy

Sir C. Darwin at Institute of Metals Luncheon

THE opinion that atomic energy would provide a very interesting new application of metallurgy was expressed by Sir Charles Darwin, Director of the National Physical Laboratory, when he proposed the toast of "The Institute of Metals" at a luncheon held by the Institute at the Connaught Rooms, Great Queen Street, London, W.C.2, on Thursday last week. The luncheon, which was held in conjunction with the autumn meeting of the Institute, was the first for seven years.

Sir Charles qualified this opinion by adding that the most interesting thing, however, was not always the most obvious. The most obvious thing was that they had to learn much more about the metallurgy of uranium and other metals of that kind, but of greater interest and importance were the other metals which would come into the devising of any machine for atomic energy. The chemical character of those other metals was of importance, but it was the nuclear character of those elements which was of paramount importance.

New Assessment of Elements

He thought the Institute might feel that it rather had the laugh of its brother, the Iron and Steel Institute, because it happened that iron had a particularly discreditable nucleus, with the result that all the engineers working in connection with atomic power would have to struggle very hard to avoid dealing with iron. In consequence, investigation was required into a large number of the seventy or eighty metals. Some of them would have really well-behaved nuclei, and it would be the duty of members of the Institute to work out the engineering properties of those elements, so that they could be as good as the old-fashioned iron alloys which had been used in other engineering work. The effect of it would be, of course, that a good many elements which had hitherto been regarded as nothing but museum specimens might easily become quite important.

The indirect impact of atomic energy was even more important. They would have seen a certain amount in the Press about the use of tracer atoms. By various nuclear treatments it was possible to make atoms of almost any element radioactive in such a way that a very minute trace of those atoms could be used to be quite certain, for instance, what impurities there were in any material. That was something which they could say with some confidence that they would be able to do within a matter of months rather than years; it belonged to the immediate future, and he expected that it would make a revolution in very many branches of science.

The most immediate branch which was most exciting was the biological sciences, because there it would be possible, and was already possible to a large extent, to find out a good deal about the behaviour of living matter. An unkind providence had provided, however, that the elements which were most tiresome to use as tracers were oxygen, nitrogen and carbon, and those were exactly the ones needed for biological work, so that although that work was the most important it was also the most difficult. In inorganic chemistry, with the great majority of the metals it would be possible with more or less convenience to produce tracer elements, so that they should be able to put some of their tracer into an alloy which they were making and be able to say: "All the copper that I put in has gone into the grains which are purple when looked at under the microscope."

Neglect of Thermodynamics

Sir Charles went on to say that there was a great subject in modern physical theories which seemed to him to have been unduly neglected, in particular in this country, and that was the subject of thermodynamics. It was a subject of the most desperate generality, but unfortunately one of the greatest generalisations about it was that almost everybody found it very difficult indeed to understand and to apply, unless he had been brought up on it. He had expressed the view to people abroad that there was not enough thermodynamics applied in metallurgy, and one man replied: "That is in England; we do it." There might be large parts of metallurgy where thermodynamics would have no application at all, but if it had none that should be known; it should not be just that they thought it had none.

He discussed with a prominent chemist the question of why people in this country were so bad at thermodynamics and he put it in this form: "Why is it that people in England have not the same easy confidence in talking about entropy that they have in talking about energy?" The chemist's reply was: "Well, I taught thermodynamics for many years, and I did it without ever talking about entropy at all, and that makes it much easier!"

Response to the toast was made by the president, Col. P. G. J. Gueterbock, C.B., D.S.O., M.C., who was in the chair. He said he felt confident the subject of nuclear physics would provide the Institute with many papers and discussions of the greatest

lue. He was whole-heartedly in agreement with Sir Charles Darwin on the importance of thermodynamics in metallurgical studies, but, speaking for a small minority—the processers and smelters—he did not think they had neglected the subject. Some of their processes were based on the principles of thermodynamics, and had brought the industry, technically at any rate, to be well in the front of world practice. They might be a minority, but they had realised for many years the importance of thermodynamics.

He suggested that there were others besides metallurgists who might profit by a study of those principles. They were coming to a state, socially and economically, where "The Lord High Coachman on the box and the Lord High Vagabond in the stocks, all shall equal be." When he was very young he was taught that in a system where everything was the same temperature no useful work could be done, but in the economic and political sphere they were tending to a state of maximum entropy. Many of the fundamental facts on which thermodynamics was based applied to *homo* (so-called) *sapiens*, and perhaps their economists and statesmen might consider this dreadful word entropy.

Lieut.-Col. the Hon. R. M. Preston (past president) proposed the toast of "The Guests," and a reply was made by Capt. the Rt. Hon. Oliver Lyttelton, P.C., M.P.

SAFETY FIRST

Amenity as a Feature of Chemical Works—III

by JOHN CREEVEY

IN spite of the improvements which have been made during the past 20 years, there are still branches of industry with chemical interests which may be collectively grouped as "offensive trades." Here, considered distinct from all other directions, amenities offered to workers become of paramount importance, and when we recall some of the conditions which formerly existed it is a little surprising that anyone ever made it their work to engage in the industries concerned.

Offensive or noxious trades are, of course, subject to regulations by local authorities under specific statutory provisions. Some are enumerated in the Public Health Acts; others have been made the subject of special orders brought to statutory standing by powers conferred on local authorities under the Health Acts or the like. It is now just over 70 years since attention was first directed to the need for legislative action in this direction, for the first general inquiry into "the effluvium nuisances which arise in connection with various manufacturing and other branches of industry, especially with regard to the effect upon health of each such nuisance, and to the degree in which the nuisance can be prevented," was made in 1875 at the instance of the President of the Local Government Board. The report of the inquiry carried out by Dr. Edward Ballard, one of the medical officers of the Local Government Board, published 1882, is virtually a classic in the literature of industry, for it gives a complete and authentic record of the state of things existing in trades falling within the scope of the inquiry between 1875 and 1877.

According to the statements given in Dr. Ballard's report, the then existing state of affairs appears to have been due mainly to absence of scientific knowledge rather than to any unwillingness on the part of owners of works to incur expenditure on plant or to make special provisions to mitigate the nuisances and bad health conditions under which employees were working. Absence of proper scientific knowledge, in turn, brought inability to design plant for carrying out an offensive task in as clean and safe a manner as possible, especially in the treatment of the resulting unpleasant vapours which developed bad smells in the vicinity of the works as well as almost intolerable conditions within the works. Waste flesh, bones, fats, etc., were the staple materials entering into the manufacturing processes concerned, later to be followed by decaying fish and fish offal as the fish meal industry was developed.

In the attempt to improve conditions, steam was introduced for boiling purposes (in place of coal-fired boilers), and jacketed digesters were adopted, subsequently giving place to the concentrator, where, by further improvement, the vapours and evolved gases could be led away to be cooled and scrubbed in condensing plant, while the residual air and gases from the condensers were burned or perhaps more conveniently deodorised. All this was done before the outbreak of the 1914-18 war, when there was a notable expansion in the so-called

offensive or noxious trades, occasioned by the need for utilising "waste" materials to aid the war effort. The production of fish meal was then supplemented by meat meal for poultry and pig feeding, and simultaneously the large municipal abattoirs installed plant for the recovery of grease from condemned carcases as well as from offal, with the reduction of this valuable "waste" to a meat meal.

Foul Air Nuisance

Offensive or noxious trades, however, are of wider scope than might be inferred from the foregoing statement. They include also the drying of blood, tallow melting, bone degreasing, gut scraping, fellmongering, tanning, and similar processes. Over and above conditions peculiar to each process, it is the foul air that is usually responsible for the greatest nuisance. Even when the volume of foul air is not particularly great, it may be extremely offensive. For burning this air it was formerly necessary to instal specially-designed furnaces, which had to be controlled within narrow margins and under expert supervision. Subsequent developments introduced chlorine as an effective means of deodorising condenser air, even when that air was at its worst, thanks to the precise nature of the raw material which was under treatment. Nevertheless, there still remained the problem of destroying some of the offensive effluvia which result from manufacturing operations, and were it not for constant alertness in connection with trades likely to become offensive, we might well find ourselves back under conditions almost comparable with the year when the first general inquiry was set on foot.

The fact that dissemination of scientific knowledge brought improvement in the state of affairs exsting in 1875 needs a little emphasis in present-day circumstances. While it is sometimes difficult to avoid the tendency of a process to give rise to offensive vapours or effluents, the improving of conditions does not end with adopting means for avoiding public nuisance in the neighbourhood of the works; those employed at the works also demand due consideration. It is true that the health interests of personnel in general are watched over by various regulations which are enforced when the need arises, yet the owners of works may still find ways for improving still further the conditions under which employees are working. Here again, it is not always the administration side of the works which is wholly at fault for any lack of detailed attention to this matter; there is often genuine absence of knowledge as to how a works may be improved to offer real amenities to the employees.

In the first place, focussing attention upon a process likely to give nuisance or annoyance from its obnoxious nature, it must be fully realised that many raw materials of organic nature are liable to putrefy rapidly unless means are taken to avoid this; yet such means may not be favourable to the ultimate course of processing. In these circumstances much can be done towards the betterment of existing conditions by seeing that any such raw material as delivered to the works is in its best or "freshest" condition, even though necessarily a "waste," not otherwise usable and essentially discarded because of liability to offensive putrefaction. At the same time the accommodation provided at the works for reception of this material must be proper and convenient, works routine being so organised that accumulations can be worked up with due expedition or promptness. Furthermore, it is essential to see that the capacity of the plant installed is adequate to deal with the amount of raw material arriving at the works, within safe limits of storage under conditions which will not create a nuisance. That is the first thing to be done to make conditions better for those who are employed within the works.

Although a man may find it convenient, for the purpose of livelihood, to engage in work which the majority of others would consider highly distasteful, it should not follow that the employer can rest content in the knowledge that he has people to operate his processes, and that nothing need be done (on his part) to make that employment more congenial and cleaner and safer, over and above such provisions as are enforceable by law. If lack of knowledge of existing conditions is pleaded, it is no excuse; for all owners of works should be fully conversant with environment as well as with the exact nature of the processes which are operated.

FUEL ECONOMY

In a circular letter to industrial concerns the Minister of Fuel, Mr. Emmanuel Shinwell, states: "Stocks of coal held by power stations, gas works and industrial undertakings are substantially lower than they were this time last year. I am making every effort to increase the output of coal but there is a danger that next winter industrial production will be seriously curtailed.

"A new effort to save fuel and power is essential if this danger is to be averted. War-time experience showed that extraordinary savings were made when the management instituted and wholeheartedly encouraged a fuel watchers' system. With changes in staff and production your fuel watching may have lost its effectiveness, and I believe that the best chance of making the necessary savings quickly is to revive that enthusiasm."

A CHEMIST'S BOOKSHELF

SYSTEMATIC INORGANIC CHEMISTRY OF THE FIFTH-AND-SIXTH-GROUP NONMETALLIC ELEMENTS. By D. M. Yost and H. Russell. Oxford University Press. Pp. 423. 21s.

Some chemists tend to take up the quite unjustified attitude that inorganic chemistry, apart from the frills and trimmings, has been complete for a number of years, and that the existing books dealing with this branch will continue to be up-to-date to the end of time. In actual truth, of course, many new facts are yearly added to the literature of inorganic chemistry. And, even more important, many new ways of co-ordinating the knowledge which has been amassed are discovered, while just as many undoubtedly remain to be discovered.

As a consequence, while books which deal with modern aspects of inorganic chemistry tend to discuss "chapters" of topical interest, there is still room for books which will cover the systematic field in the light of new theories. Such a book is this one, which takes a small section of the periodic system and deals with it comprehensively.

The selection of elements by the authors would seem to be rather arbitrary. Although the title refers to the non-metallic elements of the fifth and sixth groups, investigation shows that of Group V elements only nitrogen and phosphorus are considered. The elements oxygen, sulphur, selenium, and tellurium represent Group VI more adequately. Arguing from the inclusion of the last of these elements, it seems rather in the nature of hair-splitting to exclude arsenic and antimony; and, to be frank, consideration of the nitrogen sub-group as a whole would have been very welcome.

This is all the more so since the treatment accorded to the six elements dealt with is first-rate. There can be practically no chemist, interested in theoretical aspects of these elements at any level, who will not find the book valuable.

In the preface, the authors outline their aim concisely, and claim that "the factual material chosen for presentation has been selected as critically as possible, and the sources are the original literature or the results of the authors' own researches. . . . In the topics presented in the book the reader will find many problems worthy of the serious attention of research workers in both pure and applied chemistry. Further, the advanced student should gain from the topics discussed a feeling for the present state of knowledge, and an appreciation of what has been accomplished in the past and what may reasonably be expected of the future." On reading the book, one realises that this is a fair statement, not only of the aims, but of the achievement.

Facts are presented critically, a method which is so often missing in comprehensive text-books of this nature. The reader is left convinced that the critical faculties directing the selection are competent. The arrangement of the matter is clear, and references to the literature are many. No feeling of uncertainty prevents the authors from stating where they consider that any item of research, or, indeed, any generally accepted "fact," is unsurely based or has little foundation. Basic reactions, preparations, and properties are fully and clearly detailed. The results of modern research on the structures of the molecules of the various compounds are summarised and frequently illustrated by diagrams.

There is, perhaps, bearing in mind the inorganic chemist, too great a predilection for thermodynamical data. This preponderance is undoubtedly derived from the research activities of the authors. Perhaps this is a good thing, however, since it at least brings home to the reader the interdependence, nowadays, of all branches of chemistry. It will also, undoubtedly, be of great value for the research worker, both in the industrial field and in the region of reaction mechanics.

If one minor criticism of the book might be voiced, it is that there is often more information given than is readily apparent. Thus, for example, nitrides are not to be found in the index, but on reading the sections on nitrogen one finds a reasonable amount of information on the metallic nitrides. On leaving the book—which will, however, be returned to again and again as a valuable work of reference—the reviewer's principal regret is that the authors have followed the recipe of Mr. Weller, writing so that their readers will "vish there vas more." As already indicated, even three more elements would have been warmly received. But how pleasant it would be to feel that for about fifteen guineas (using the present rate for calculation) one might possess a comparable treatment of all the elements in the periodic system.

CECIL M. WILSON.

ENTERPRISE FIRST. By William Wallace. London: Longmans Green. Pp. 112. 8s. 6d.

Mr. William Wallace, who is a director of Rowntree's, has written a book which will annoy extremists of every political shade but will interest all who are seriously concerned about the future of British industry. During the 1914-18 war he had a taste of Government as a temporary civil servant and throughout the recent war was a director of the Ministry of Food. Mr. Wallace's career began with a "first" in Law and he holds the degree of Master of Commerce at London University. No one, therefore, can doubt his qualifications for discussing the "relationship of the State

to industry, with particular reference to private enterprise," although some of his friends may feel that he is too modest in the opening chapter, which stresses that he is writing in a purely personal capacity.

Stating boldly that Britain, "running true to form," is reasonably certain to evolve its "own particular middle-of-the-way solution," the author believes that it may not be very logical—"we may perhaps be suspicious if it were"—but the test will be the practical one: Will it work? He further believes that the problems of scarcity and surplus, balance of payment and exchange, etc., are too big in the post-war world to be tackled by unaided private enterprise; and that the "ordinary Briton demands a further phase of economic emancipation" in what Mr. Wallace's American namesake has termed the "Century of the Common Man."

An early chapter discusses the rôle of the permanent Civil Servant, who is, of course, precluded from taking part in public controversy. Whatever else Mr. Wallace's book may accomplish, it will put him greatly in the debt of this small but highly experienced body on whom the brunt of day-to-day Government at its highest level falls. Indeed, everyone who glibly criticises Whitehall should be compelled to read chapter III, which reveals how much the country owes to some 1400 men who—excluding the diplomatic and consular service—number less than one-third of one per cent. of State servants as a whole. Officially, this group has no politics; and its complete integrity is the envy of every other country in the world.

Yet, turning to the problems of industry, Mr. Wallace is equally clear that the Government machine is not adapted to the delegation of initiative and responsibility, which is the essence of successful management. In theory, a Minister may not delegate his responsibility at all, and in practice senior Civil Servants move from one job to another, frequently at short notice, "without the slightest regard to the technical knowledge required for the job or to the bearing of their previous experience on their qualifications for handling the new job."

It is the function of a Government department to carry out the instructions of Parliament, and a body appropriate to administer the law is not suited to manage industry, which constantly requires swift decisions made on the spur of the moment, not bound by regulation and precedent. Mr. Wallace shows, however, that the higher Civil Service in partnership with industrialists achieved remarkable results during the war, and instances the record of the Ministry of Food. Every day, supplies of every kind had to be available in hundreds of thousands of shops, distributed evenly among 44 millions of a rapidly changing population, in spite of the fall of countries of supply, the sinking of ships, the wholesale bombing, and the competing demands on transport of all other forms of war necessities.

How the lessons of war can best be applied to the needs of peace is discussed by the author, whose conclusions have gained weight in the twelve months since the book was written. His comments on trade unions and freedom also deserve attention in the light of "closed shop" developments. Mr. Wallace sets out some detailed proposals for achieving the sense of unity and teamwork so much needed in British industry to-day.

J.A.B.

Polyvinyl Butyral

Its Use in Laminated Safety Glass

THE use of polyvinyl butyral has almost entirely replaced that of cellulose acetate as an interlayer in the laminated safety glass now produced by the Triplex Safety Glass Co., Ltd., according to an announcement made by Sir Graham Cunningham, chairman and managing director of the company, at a press conference at the Waldorf Hotel, Aldwych, London, W.C.2, on Monday.

The new type of plastic interlayer not only renders glass capable of withstanding nearly three times the strain previously possible, it makes possible more thorough adhesion between the glass and itself. As polyvinyl butyral is purely synthetic and not a cellulose derivatve, its quality is more consistent and its physical properties can be controlled to give the maximum safety properties. Its capacity for absorbing moisture is very low and as there are no volatile constituents within the "sandwich" which might escape round the edge, edge-sealing has been rendered unnecessary. Roof exposure tests extending over a period of five years, both in this country and abroad, have shown none of the discoloration that was an unwelcome feature of earlier types of safety glass, and the loss of light transmission has been smaller than the eye could detect.

Practical proof of the validity of the claims advanced for the new glass was given by Dr. A. A. C. Waine, Ph.D., D.Sc., chief chemist of the company, whose demonstration included his jumping on to a stretched circle of polyvinyl butyral, and dropping a 1.68 lb. ball on to a sheet of the new glass from a height of 20 ft.

Argentina's imports of chemicals, pharmaceutical products, oils and paints increased from 13,638 metric tons in January to 19,903 metric tons in February, according to Argentine customs statistics.

Chemicals from Coal

Col. W. A. Bristow's Views

THE increasing importance of the production of oils and chemicals from coal was stressed by Col. Whiston A. Bristow, F.Inst.F., M.I.E.E., M.I.A.E., chairman and managing director of Low Temperature Carbonisation, Ltd., when he addressed the annual general meeting of the company recently.

In the course of his speech, he said: "I have been asked questions about the advent of atomic energy and how it may affect our industry. I think its use for industrial purposes will be with us before long, probably in the form of electrical power, though there is no present indication of its being able directly to supply the motive power for the motor-car, aeroplane, or ship.

"Oil and coal appear, as a result, to be approaching a crossroads. From being chiefly sources of heat and light, they are being directed more and more into use as raw materials for the chemical industry. The complex carbon compounds of which they are composed are being identified and separated for use individually or broken down into simpler chemical units or 'bricks' wherewith to build up the fascinating chemicals and plastics of the new age. In common with other research organisations, we have been working along these lines for some time past and we are quite confident that, in that art, carbonisation is already taking an important part. It appears inevitable that this country will turn more and more in that direction in order to make the maximum use of its increasingly valuable, but limited, coal resources for the expansion of the industries such as ours which are based upon hydrocarbons and their derivatives.

Improvement of Lubricants

"To give you an example, a potentially important aspect of hydrocarbon synthesis is the development of lubricating oils. At present these are derived mainly from petroleum by distillation and refining, and until recently coal has taken little part in their production. Modern lubricants are being vastly improved, however, by the addition of special chemicals and in many cases these are being derived from coal. It also appears likely that the not too distant future the hydrocarbon 'bricks' will be built up into synthetic lubricating oils, the structure of which is likely fundamentally to incorporate these same additives or their properties. Coal hydrocarbons and coal chemicals may, therefore, conjointly be concerned in furnishing a new section of the lubricating oil industry and we have already begun to play our part in such developments."

Earlier in his speech, Col. Bristow referred to the Government's coal nationalisation policy. He said: "The Government have already stated that they are desirous of taking measures to restrict the burning of raw coal, to encourage the use of smokeless fuel, to diminish atmospheric pollution, and to encourage the more scientific utilisation of coal in order to preserve the valuable oils and chemicals contained therein instead of burning them. It was for these very reasons that the 'Coalite' process of low temperature carbonisation was invented, and they were actually set out in the patent of 1906. For the first time in our history they have now become an important part of a national fuel programme, initiated and to be carried into effect by the Government; that is, we were 40 years ahead of the national realisation. The price of bituminous coal has risen so greatly that we cannot afford to burn it in the raw state. In 1927 it was so cheap and so plentiful that producers were only too glad to find means of burning it, but a very different state of affairs exists to-day with coking smalls at four to five times the price and in very short supply.

Increasing Demand

"The production of oils and chemicals from coal has become a much more important matter than it was 20 years ago, and the commercially disposable materials are more numerous and valuable. The greatly increased requirements of our plastics industry are already in excess of production and will become even more so. There are also other new industries and processes now coming into being which will increase still further the demand for the higher priced products. Within the past few days, for example, we have made a contract for the supply of one of our materials for an entirely new purpose and to the extent of nearly £20,000. We have, as a result of our own research work, evolved still further products of even greater value for which there is a ready market.

"It is more than ever important that our export trade should be maintained. It seems unlikely that we shall be able materially to expand our export trade in coal itself, especially as we do not now raise enough for our own requirements. We can, however, export the liquid products we extract from coal and have already established a very satisfactory business. We ship to many countries in America, Europe, Asia, and Africa. We are even now constantly having to refuse substantial orders. We have sold every gallon we could make since we erected our first distillation plant in 1929."

Experiments in Coking Practice

Oven Types and Coke Properties

A REPORT, *Experiments on Coking Practice*, just issued by the Fuel Research Organisation of the D.S.I.R., and published by H.M. Stationery Office at the price of 4s., provides information of value to the coke-oven and metallurgical industries, particularly to those undertakings faced with the need to instal new batteries of ovens.

In the past, experience of the behaviour of coal coked in any particular battery of coke-ovens has generally been limited to coals or blends of coals drawn from an area adjacent to the battery. Shortly before the war, however, the Fuel Research Organisation of the D.S.I.R., in co-operation with the coke-oven and steel industries, began a comprehensive investigation of the carbonisation of different coals in commercial coke-ovens of several types operating under various conditions. The purpose of the investigation was to obtain precise information on the influence of the coal selected, the design of oven, and the methods of operation on the quantity and character of the coke produced, and the suitability of the coke for metallurgical purposes.

Owing to the war it was possible to complete tests with only three coals: from South Yorkshire, Durham, and South Wales; and of the six coke-oven installations, two were in Durham, and one each in Yorkshire, Lincolnshire, Scotland, and South Wales.

The ovens, which ranged in width from 12 to 21 inches and in capacity from 7 to 17 tons per charge, were operated under the control of the coke-oven managements in accordance with their experience; and complete records were made of the conditions of operation. Four of the ovens were of the vertical-flue regenerative type, one had horizontal flues, and one was a waste-heat oven.

Special precautions were taken to ensure that the consignments of each coal to the several coke-ovens were of the same quality. The cokes obtained were examined not only by the usual physical and chemical tests, but also by X-ray crystallographic methods, and there were some tests with a small cupola to assess the cokes for foundry use.

It was not considered desirable to draw hard and fast conclusions from the limited experimental data available, but within the range of experimental conditions defined the following trends were noted. Increased rates of coking appear to reduce the size of coke and to reduce its strength. The coke from the narrowest oven was exceptionally large. The series of experiments indicates no orderly relation between width of oven or rate of heating on the one hand and coke abrasion indices or reactivity on the other. Coke reactivity appears to be governed more by the nature of the coal carbonised than by condition of coking.

In addition to tables and charts of results, the report includes a large number of photographs of samples of the cokes, and of sections specially prepared to provide information on their internal structure.

Scholarships in Metallurgy

Nuffield Travel and Research Scheme

A FELLOWSHIP scheme and two scholarship schemes designed to advance research, teaching, and training in extraction metallurgy have been established by the Nuffield Foundation. The scheme is in three parts:

(a) Five Travelling Fellowships are being offered each year to members of the teaching staff of universities and approved schools of mines and metallurgy within the Commonwealth and Empire. The aim of this scheme is to enable teachers to visit important mining and metallurgical centres in the Empire in the long vacation in order to study the methods employed in those centres. The value of each fellowship will be up to £500, including the cost of travel. The duration of each fellowship will be approximately three months.

(b) Five Travelling Post-graduate Scholarships are being offered each year for junior members of the profession who are graduates of universities and approved schools of mining and metallurgy in the Commonwealth and Empire and who have specialised in extraction metallurgy. Candidates will be selected not necessarily on account of their order of merit in examinations, but with regard also to their personality and general suitability. The value of a scholarship will be up to £500, including the cost of travel. The duration of a scholarship will not usually exceed six months.

(c) Ten Vacation Scholarships for students of mining and metallurgy at universities and approved schools of mines and metallurgy within the Commonwealth and Empire, to enable them to travel by air to important mining and metallurgical centres for vacation work. The value of a scholarship will be up to £200 to cover the cost of air travel.

The scheme has been drawn up in co-operation with the Institution of Mining and Metallurgy, which will continue to assist the foundation in the operation of the scheme. Full particulars, and forms of application for scholarships, may be obtained from the Secretary, Nuffield Foundation, 12/13 Mecklenburgh Square, London, W.C.1.

Personal Notes

MR. E. G. GOUGH has been appointed a director of Thomas de la Rue & Co., Ltd.

MR. A. V. LILLY has succeeded Mr. A. A. Houghton as chief chemist to Fredk. Boehm, Ltd.

DR. E. GREGORY, M.Sc., F.R.I.C., and BRIGADIER A. LEVESLEY, O.B.E., have been appointed directors of Edgar Allen & Co., Ltd.

ALDERMAN HENRY WILKINSON, who is service manager to Lever Brothers, Ltd., Port Sunlight, has been invited to become Mayor of Bebington, Cheshire, next year.

MR. W. D. RAE, B.Sc., A.R.I.C., chief research chemist to the Andre Rubber Co., Ltd., has been awarded his Ph.D., his thesis being "Some studies in the bonding of rubber to metal."

MR. S. C. DIGGORY, who has retired from the service of Monsanto Chemicals, Ltd., after being with the company and its predecessors since 1914, is well known in the chemical trade in Scotland and the North of England.

MR. W. W. STEVENSON, F.R.I.C., who has been appointed chief metallurgist to Dorman Long & Co., Ltd., has been assistant director of the research and development department of United Steel Companies, Ltd.

PROFESSOR C. H. LANDER, C.B.E., D.Sc., is retiring from the Chair of Mechanical Engineering in the University of London (City and Guilds of London Institute) at the end of this month, and will be succeeded by DR. O. A. SAUNDERS, D.Sc.

DR. E. CHAIN, who shared the Nobel chemistry award of 1945 with Fleming and Florey, is to be technical chief of a factory producing penicillin at Hälsingborg, Sweden, which is co-operating, in its manufacture, with Danish chemical interests.

The following departmental chiefs of Low Temperature Carbonisation, Ltd., have been appointed to the board: MR. F. L. WARING, works superintendent; MR. J. P. POSTLETHWAITE, chief engineer; and MR. J. H. STEPHENS, head of the sales organisation.

MAJOR P. G. ROBERTS, M.P., who has joined the board of Newton Chambers & Co., Ltd., is managing director of the Wombwell Main Colliery and a director of the Barnsley District Coking Co., Ltd., also of the Midlands steel and engineering firm of Wellman, Smith, Owen & Co., Ltd.

DR. W. H. DOW, president and chairman of the Dow Chemical Company, and president of the Ethyl-Dow Chemical Company, has been awarded the Chemical Industry Medal of America for 1946. Presentation of the medal will be made in New York on November 8.

PROFESSOR J. L. SIMONSEN, Director of Colonial Products Research, and PROFESSOR SIR IAN HEILBRON, Professor of Organic Chemistry, Imperial College, left Britain by air on September 15 for a short visit to East and Central Africa. They hope to confer with scientists and other experts about the increased utilisation of Colonial raw materials and the organisation of research on the subject. They will also pay a short visit to the Union of South Africa, at the invitation of the Union Government.

Obituary

SIR JAMES HOPWOOD JEANS, O.M., F.R.S., died at his home at Dorking, Surrey, on September 16, five days after his 69th birthday. Though chemistry cannot claim him as a disciple, his work on stellar physics, which he approached from the mathematical side, has been of vital importance to the fundamental study of science as a whole. Of perhaps even greater importance to mankind in general was the rare faculty of exposition, possessed by Jeans to the full, by which means he was able to give the man-in-the-street some conception of what physics really means. Sir James Jeans was elected F.R.S. in 1906, and served as a secretary of the Royal Society in 1919-29; he was knighted in 1928.

International Congress

London Meetings Next Year

WHEN the 10th International Congress of Pure and Applied Chemistry was held in Rome in May, 1938, it was decided that the 11th Congress should be held in London in 1941, concurrently with the celebration of the centenary of the foundation of the Chemical Society of London. By reason of the war, both the centenary celebrations of the Chemical Society and the 11th International Congress were postponed; it has now been decided that both events should take place in London in July, 1947.

The 11th International Congress of Pure and Applied Chemistry will meet in London, under the presidency of Lord Leverhulme, from July 16, 1947, to July 24, 1947, and it is hoped that delegates from many countries will be present. Further information may be obtained from the hon. organiser at the following address: The 11th International Congress of Pure and Applied Chemistry, 56 Victoria Street, London, S.W.1. (Tel.: VICtoria 5216).

General News

International postal reply coupons are again interchangeable in Italy and Germany, and can be obtained from the larger post offices in the U.K.

About 100 tons of copper will be required for the campaign stars now being struck at the rate of 15,000 a day at the Royal Mint and Woolwich Arsenal.

The price of refined platinum has been increased by a further 50s. to £23 5s. per troy oz., making a total rise, since the beginning of July, of £6 5s., or 37 per cent.

The Geological Museum, South Kensington, which was closed throughout the war, opened on September 18 with an exhibition illustrating the war work of geologists.

Work has started on the new £125,000 Beecham Group Factory at St. Helens, which is expected to be completed towards the end of next year. It is hoped to employ an additional 400 hands to assist in the export drive.

A new power plant costing £500,000 is being built by Dorman Long and Co., Ltd., of Middlesbrough, at their Cleveland works in Yorkshire. Construction has also begun at the works of a new central ore unloading and ore preparation plant for the whole group at a cost of £1,250,000.

Traces of oil at a depth of 4920 ft. have been found at Gringley, near Doncaster, by engineers of the Anglo-American Oil Company, after six months of boring. Coal measures were also revealed by the drills, and tests are now being carried out to determine the commercial possibilities of the oil.

After 80 years, Reads, Ltd., of Liverpool, are leaving 21 Bridgewater Street for new offices at Orrell House, Orrell Lane, Liverpool, 9, to which all communications should now be addressed. (Tel. Aintree 3600.) The company has received a licence to construct a new factory adjacent to its two existing plants at Orrell Park, so enabling them to increase the manufacture of their range of tins and drums and to centralise their plant.

Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, are opening an office in Buenos Aires in November as part of the firms contribution to the country's export drive. Mr. Bryan French, hitherto manager of the inquiry department of *The British Trade Journal and Export World* (also published by Benn Brothers, Ltd.), will be in charge of the office and will be able to provide British manufacturers with first-hand information about current trading conditions and market possibilities for their products in the Argentine.

From Week to Week

The Industrial Group of the Manchester Statistical Society, whose first meeting of the session is announced under the Forthcoming Events heading this week, exists to promote the knowledge and use of statistics in industry. Speakers include representatives of the chemical, steel, textile, and engineering industries.

In view of the very great dearth in London of the special accommodation required for rubber storage, some cargoes of rubber due to arrive shortly are being diverted to other ports, such as Liverpool. This will not involve any additional strain on inland transport, as the Midlands area consumes large quantities of rubber.

More than five hundred firms interested in industrial design will be represented at the conference to be held at the Central Hall, Westminster, London, S.W.1, on September 26 and 27, under the joint auspices of the Council of Industrial Design and the Federation of British Industries. This conference is the first of a series in conjunction with the "Britain Can Make it" Exhibition, and the importance of industrial design, notably in relation to Britain's export trade, will be stressed by speakers of authority.

Foreign News

Experiments with DDT are reported to be taking place in forestry stations in the U.S. zone of Korea.

Platinum is now quoted in the U.S. at $90 an ounce, according to *American Metal Market*.

Discussions as to the fate of the Japanese iron and steel industry are still proceeding, and although certain preliminary dismantling of plant against reparations account has been authorised, the final level of capacity and production has still to be agreed upon.

Four industrial scientists of the Monsanto Chemical Company have been granted leave of absence on full pay, for the purpose of spending a year of academic study at universities of their choice—a new move in American industry towards closer liaison between industry and the university laboratory.

The Smithsonian Institution in Washington celebrated the 100th anniversary of its inauguration last month. James Smithson, the founder, who left £100,000 to the U.S.A. "for the increase and diffusion of knowledge," was an Englishman of republican views, but never visited the United States. He was a distinguished chemist and mineralogist, but most of his original scientific papers perished in a fire at the Institution in 1865.

The title of the well-known American journal, *Chemical and Metallurgical Engineering*, was changed to *Chemical Engineering* with the August issue.

The sulphur refinery at Keciboriu, Turkey, is expected to be enlarged this year. At present sulphur production in Turkey does not meet domestic needs.

The centenary was celebrated, on September 7, of the inauguration of the iron works at Choindez, in the Swiss Jura, owned by the Ludwig von Roll'sche Eisenwerke A.G.

The Fabrique d'Engrais Chimiques, Fribourg, is paying an unchanged gross dividend of 7.14 per cent. on the share capital of 135,000 francs, equal to 5 per cent. net.

The first post-war trade fair in Prague was opened on September 15 by Dr. H. Ripka, Minister of Foreign Trade. It includes exhibits from nine foreign governments, and among private firms, three British, two Canadian, and one Swedish are exhibiting.

The Netherlands Government expects to import chemicals to the value of $14 million from the U.S. in 1946, part of a total of industrial imports amounting to $250 million. The imports are being financed partly by loans, partly by the realisation of recently unfrozen Dutch assets in the U.S.

A banquet dedicated to the promotion of the aims of UNESCO was held in Chicago on Friday last week, sponsored by the U.S. National Chemical Exposition (held at the Chicago Coliseum, September 10-14). The after-dinner subject for discussion was "The Rôle of Science in Building World Peace."

Forthcoming Events

September 21. Royal Institute of Chemistry (London and S.E. Counties Section). Oak Restaurant, 18 Kensington High Street, W.8. 7 - 11 p.m. Social dance in aid of benevolent fund.

September 23-28. Welsh Industries Fair. Drill Hall, Cardiff, 11 a.m.-6 p.m.

September 25 and 26. British Ceramic Society (Refractory Materials Section). Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1. Autumn meetings. Sept. 25: 10.15 a.m., business, followed by joint discussion with Building Materials Section; 12.30, lunch; 2.30 p.m., papers. Sept. 26: 10 a.m., papers.

September 25 and 26. British Ceramic Society (Building Materials Section). Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1. Autumn meetings. Sept. 25: 10.15 a.m., business, followed by joint discussion with Refractory Materials Section; 12.30, lunch; 2.30 p.m., discussion; 4 p.m., paper. Sept. 26: visit to Stewartby works of London Brick Co., Ltd., 9.25 a.m. train from St. Pancras.

September 26-27. Council of Industrial Design and Federation of British Industries. Central Hall, Westminster, London, 10 a.m.

September 26. Royal Statistical Society. (Sheffield Group). Royal Victoria Station, Hotel, Sheffield, 6.30 p.m. Mr. A. W. Swan: "What Statistics Can Do in Industry that Other Methods Cannot Do."

September 26. Imperial Institute. Cinema Hall, Imperial Institute, South Kensington, London, S.W.7, 3 p.m. Mr. S. Bracewell: "The Geology and Mineral Resources of British Guiana."

September 26. Oil and Colour Chemists' Association (London Section). Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1, 6.30 p.m. Mr. G. T. Bray: "Drying Oils and Oil Seeds in the British Empire."

September 27. Manchester Statistical Society (Industrial Group). College of Technology, Sackville Street, Manchester 6.30 p.m. Mr. Dennis Newman: "Sampling Inspection: Statistical Considerations."

October 2. Institution of Works and Factory Managers (Midland branch). Queen's Hotel, Birmingham, 7 p.m. Mr. C. R. Jordan: "The Different Problems Arising in the Management of Small and Large Factories."

October 3. Oil and Colour Chemists Association (London Section). Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Professor H. W. Melville: "The Chemistry of High Polymers—I."

October 3. The Chemical Society. Burlington House, Piccadilly, London, W.1, 7.30 p.m. Mr. J. M. Robertson and Mr. J. G. White: "The Crystal Structure of Pyrene: A Quantitative X-Ray Investigation;" Mr. R. F. Barrow, Mr. C. J. Danby, Mr. J. G. Davond, Mr. C. N. Hinchelwood and Mr. L. A. K. Staveley: "The Re-distribution and Desorption of Adsorbed Gases."

October 7. Society of Chemical Industry (London Section). Chemical Society's rooms, Burlington House, Piccadilly, London, W.1, 6.30 p.m. Dr. W. H. J. Vernon: "Chemical Research and Corrosion Control: Some Recent Contributions of a Corrosion Research Group."

Company News

The nominal capital of **Germstroyd Products, Ltd.,** chemical manufacturers and dealers in germicidal liquids, etc., 47 Great Russell Street, W.C.1, has been increased beyond the registered capital of £8000 by the addition of £12,000, in £1 shares.

The nominal capital of **Tennants (Lancashire), Ltd.**, chemical merchants, etc., Manchester, has been increased beyond the registered capital of £30,000 by the addition of £5000. The additional capital is divided into 500 5 per cent. cumulative preference shares of £1 and 18,000 ordinary shares of 5s.

Beecham Maclean Holdings, Ltd., has issued details of a plan to redeem the 1,096,176 outstanding 5 per cent. redeemable cumulative preference shares and the 466,943 outstanding 5½ per cent. redeemable cumulative preference shares on October 14 at 21s. 6d. per share together with a sum equivalent to the dividend (less tax) accrued to that date. The redemption will be financed by an issue to existing holders of these classes of preference shares of 1,563,119 4 per cent. redeemable cumulative preference shares of £1 each at 21s. per share, of which holders of shares of either class may take up one new share for each existing preference share now held.

In a circular issued by **Genatosan, Ltd.,** ordinary shareholders of the company are offered conversion, on a share for share basis, into 10s. ordinary shares of a new company — Genatosan Trust — and shareholders of the new company are invited to dispose of all or part of their holdings to Fisons, Ltd., at 12s. 6d. per share. The new company's share capital is at present £1000 in 2000 shares of 10s., but as soon as the offer by it has become unconditional, its share capital will be increased to £1,000,000, divided into 2,000,000 ordinary shares of 10s. It is intended that, in due course, the new company should create and issue for cash up to £1,000,000 of preference shares.

Chemical and Allied Stocks and Shares

PARTLY owing to the better tendency on Wall Street, stock markets have rallied, and firmer conditions developed, moderate gains predominating in most sections. British Funds displayed further strength, repayment of 2½ per cent. National Defence Bonds leading to re-investment demand; 2½ per cent. Consols again rose higher, and there were all-round gains in Savings Bonds and National War Bonds. The volume of business in industrials was again moderate, international uncertainties making for caution, but good features were not lacking, and elsewhere leading oil shares showed general improvement. Spectacular gains were recorded in foreign railway stocks on the important developments affecting British-owned railways in the Argentine and Brazil.

Imperial Chemical strengthened to 43s. and there was a sharp rally in Dunlop Rubber to 74s. Turner & Newall firmed up to 85s. 3d., while United Molasses 53s. 3d., British Oxygen 97s. 6d., and Borax Consolidated 46s. became firmer. The units of the Distillers Co. rallied to 134s., while among other shares of companies with plastics interests De La Rue moved up to £12⅞ on suggestions that the £1 shares may be "split" into four of 5s. each. British Industrial Plastics were firm at 8s. 3d. and Erinoid 5s. ordinary 15s. 9d. The market is talking of a new issue by the latter company, which, it is being assumed, may take the form of an offer of additional shares to shareholders. British Aluminium were 42s. 9d., and although little changed in price, Imperial Smelting at 19s. 7½d. and Amalgamated Metal at 19s. 3d. became firmer. British Drug Houses were 53s. 9d., Fisons 60s. 6d., W. J. Bush 90s., and Cooper McDougall 40s. 6d. Plaster Products 5s. shares rose to 14s. 6d. in anticipation of an interim dividend, British Plaster Board 5s. ordinary firmed up to 33s. 9d. and Associated Cement to 66s. 9d.

Iron and steel shares showed firmness with small gains predominating, although there is continued talk that a bill may be contemplated to give the Government powers to acquire share interests in iron and steel companies. Guest Keen, after an earlier decline, have rallied strongly to 41s. 9d. Allied Ironfounders were 59s. and Lambert Bros. shares jumped strongly to 82s. 9d. on the increased distribution. Staveley were 52s. 10½d., United Steel 26s., Whitehead Iron 87s. 6d., Shipley 38s., Powell Duffryn 24s. 1½d., and Dorman Long 26s. 9d. Among electrical equipments, Associated Electrical rose to 69s. 6d. on the maiden interim dividend which has encouraged hopes that the total payment for the year may be raised from 10 per cent. to 12½ per cent. On the other hand, following news of the terms of the new issue, Johnson & Phillips encountered profit-taking and receded 2s. to 83s. English Electric showed firmness at 62s. and General Electric were 98s. 6d., but there was a sharp fall to 8s. 3d. in Brush Electrical 5s. shares on fears of a dividend "cut."

Boots Drug, after strengthening, eased slightly to 61s. 3d. Griffiths Hughes were 61s. 6d. and Beechams deferred rallied to 26s. 4½d. Paint shares strengthened on the higher prices announced by manufacturers; Pinchin Johnson were 43s. 3d., Goodlass Wall 28s. 6d., and International Paint rose to £6⅛, the last-mentioned also being helped by the higher interim dividend. Triplex Glass eased to 40s. 3d. awaiting the dividend announcement. Lever & Unilever improved to 52s., Greeff-Chemicals Holdings 5s. shares were 12s. 9d. and Monsanto Chemicals 5½ per cent. preference 23s. 9d. Among oils, Shell improved to 93s. 9d., Burmah to 70s. and Anglo-Iranian to 99s. 4½.

Prices of British Chemical Products

DELIVERIES of the chief lines of heavy chemicals during the past week have been maintained on a good scale and a fair amount of inquiry for new business has been reported from the London market. With few, if any, exceptions, prices continue strong. Among the potash chemicals the B.P. and technical grades of permanganate of potash are moving well, while the demand for bichromate of potash and yellow prussiate of potash continues to be in excess of available supplies. Steady deliveries of formaldehyde are being taken at unchanged rates and a steady demand is reported for arsenic, salammoniac, and hydrogen peroxide. In the acid section, oxalic acid continues in strong request and all grades of acetic acid are in good call. A steady trade has been put through in the soda products section, with hyposulphite of soda in good demand. The coal-tar products market continues active and most items are well booked.

MANCHESTER.—Plenty of new business is offering in the alkalis and other leading heavy chemicals on the Manchester market and the past week's inquiries have included a fair number from shippers, though in respect of the latter there is continued difficulty in arranging even approximate shipment dates for several descriptions of chemicals. On the home market existing contracts are being drawn against satisfactorily and good quantities are going forward to the textile and allied trades, as well as to other leading outlets. In several sections of the fertiliser market, notably in the phosphatics and in lime, fair buying interest is reported.

GLASGOW.—A steady volume of business has been observed passing in the Scottish heavy chemical market during the past week. Orders continue to be strong and supplies weak, and there are considerable delays in the delivery of all classes of material. The export market has also been busy with inquiries and orders, but here again various factors affect the delivery of most materials. Prices in most cases continue to rise.

Price Changes

Rises: Ammonium phosphate; ammonium sulphate; lead nitrate; lead, red; lead, white; linseed oil.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £47 10s.; 80% pure, 1 ton, £49 10s.; commercial glacial, 1 ton, £59; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—MANCHESTER: £40 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£120 to £123 per ton.

Arsenic.—Per ton, 99/100%, £26 10s. for 20-ton lots, £31 for 2 to 10-ton lots; 98/99%, £25 for 20-ton lots, £29 10s. for 2 to 10-ton lots; 96/99% white, £21 15s. for 20-ton lots, £25 15s. for 2 to 10-ton lots.

Barium Carbonate.—Precip., 4-ton lots, £19 per ton d/d; 2-ton lots, £19 5s. per ton. bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £18 15s. per ton d/d; 2-ton lots, £19 10s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial,

granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£22 to £24 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: £8 15s. per cwt. d/d.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£33 10s. per ton, f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from £13 17s. 6d. for 10-cwt. lots to £14 1s. per cwt. lots, d/d. Less than 1 cwt., 2s. 5½d. to 2s. 7½d. per lb. d/d.

Formaldehyde.—£27 to £28 10s. per ton in casks, according to quantity, d/d. MANCHESTER: £28.

Formic Acid.—85%, £54 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 19s. 6d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—11d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £60 per ton; dark tech., £53 per ton ex works; barrels returnable.

Lead Acetate.—White, 70s. to 75s. per cwt., according to quantity.

Lead Nitrate.—About £70 per ton d/d in casks. MANCHESTER: £68.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £71; orange lead, £83. Ground in oil: Red, £92; orange, £104. Ready-mixed lead paint: Red, £99; orange, £111.

Lead, White.—Dry English, in 8-cwt. casks, £83 per ton. Ground in oil, English, in 5-cwt. casks, £102 per ton.

Litharge.—£68 10s. to £71 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £36 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 9s. 1d.; smaller quantities dearer.

Mercurous Chloride.—10s. 1d. to 10s. 7d. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. per gal.; pyridinised 64° O.P 100 gal., 3s. 1d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£100 to £105 per ton in ton lots packed in free 5-cwt. casks. MANCHESTER: £5 per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 7¼d. per lb.; ground, 8¼d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £57 per ton for 5-ton lots, £57 10s. per ton for 1 to 5-ton lots, all ex store; hydrated, £51 per ton for 5-ton lots, £51 10s. for 1 to 5-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 8d. to 2s. 1d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £16 7s. 6d. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 6¼d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £45 per ton, nominal.

Sodium Hyposulphite.—Pea crystals 19s. per cwt. (ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£16 10s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£22 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £25 per ton d/d for ton lots. Tri-sodium, £27 10s. per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£5 5s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £20 2s. 6d. per ton, d/d, in drums; crystals, 30/32%, £13 7s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 5s. to £16 10s., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £54 5s.; green seal, £53 5s.; red seal, £51 15s.

Zinc Sulphate.—Tech., £25 per ton, carriage paid.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 8½d. to 2s. 7½d. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 8s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£44 to £49 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £28 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in September, £19 17s., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in September, £9 14s., rising by 1s. 6d. per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 5⅝d. to 8d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £7 2s. 6d. to £10 per ton, according to m.p.; hot-pressed, £11 10s. to £12 10s. per ton, in bulk ex works; purified crystals, £25 15s. to £28 15s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. per ton f.o.r. suppliers' works; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 1d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 1d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £25. MANCHESTER: Grey, £25 per ton.

Methyl Acetone.—40/50%, £56 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. per gal.

Wood Tar.—£5 per ton.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol 98/100%.—Nominal.**

***o*-Cresol 30/31° C.—Nominal.**

***p*-Cresol 34/35° C.—Nominal.**

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

***p*-Nitraniline.—2s. 5d. per lb.**

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

***o*-Toluidine.—1s. per lb., in 8/10 cwt. drums, drums extra.**

***p*-Toluidine.—2s. 2d. per lb., in casks.**

***m*-Xylidine Acetate.—4s. 5d. per lb., 100%.**

Latest Oil Prices

LONDON.—September 18.—For the period ending Sept. 28 (October 12 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £135. RAPESEED OIL, crude, £91. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised £56; refined hardened deodorised, £60. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £56; refined hardened deodorised, £60. PALM OIL (per ton c.i.f.), in returnable casks, £42 5s.; in drums on loan, £41 15s.; in bulk £40 15s. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62. WHALE OIL, refined hardened, 42 deg., £89; refined hardened, 46/48 deg., £90. ACID OILS: Groundnut, £40; soya, £38; coconut and palm-kernel, £42 10s. ROSIN: Wood, 32s. to 45s.; gum, 44s. to 54s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

Treatment of aluminium, etc.—D. H. Napier, J. V. Westwood, and United Anodising, Ltd. 24670.

Titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond, and R. J. Wigginton. 24456.

Crotonic acid derivatives. — Organon Laboratories, Ltd., and W. C. J. Ross. 24205.

Treatment of plastic materials.—Pilkington Bros., Ltd., J. E. Wilcock, and G. H. Baillie. 24040.

Glyceride mixtures.—Procter & Gamble Co. 24055.

Desulphurisation processes.—P. W. Reynolds, D. M. Grudgings, and I.C.I., Ltd. 24131.

Alcohols. — P. W. Reynolds, D. M. Grudgings, and I.C.I., Ltd. 24453.

Adhesives.—Shawinigan Chemicals, Ltd. 24524.

Alkaline washing agents.—Soc. des Produits Peroxydes. 24687.

Synthetic oils, etc.—Solar Manufacturing Corporation. 24472.

Glycollic acid derivatives.—A. W. C. Taylor, J. G. M. Bremner, R. R. Coats, and I.C.I., Ltd. 24450.

Pesticidal compositions.—J. Taylor, J. M. Holm, and I.C.I., Ltd. 24123.

Insecticides.—D. W. A. Wells. 24602.

Copolymers. — Wingfoot Corporation. 24410, 24411, 24415.

Rubber latex.—Wingfoot Corporation. 24412.

Esters.—Wingfoot Corporation. 24413.

Nitriles.—Wingfoot Corporation. 24414.

Aluminium, etc., welding.—Almin, Ltd., and H. G. Warrington. 24916.

Resinous material.—American Cyanamid Co. 25416.

Carbon disulphide.—C. Arnold (Standard Oil Development Co.). 24814.

Hydrocarbons.—C. Arnold (Standard Oil Development Co.). 24815, 25300, 25302-4.

Alkylation processes.—J. C. Arnold (Standard Oil Development Co.). 24813.

Hydrocarbons.—J. C. Arnold (Standard Oil Development Co.). 24816, 25301, 25306.

Oxygen production.—J. C. Arnold (Standard Oil Production Co.). 25299.

Acid dyestuffs.—S. G. Bedekar and K. Venkataraman. 25409.

Anthraquinone.—S. G. Bedekar and K. Venkataraman. 25410.

Interpolymers. L. Berger & Sons, Ltd., W. T. C. Hammond, and L. E. Wakeford. 25066.

Organic sulphides.—G. W. J. Bradley. 25020.

Treatment of cellulose products.—British Celanese, Ltd. (Celanese Corporation of America). 24946.

Vinylfluorines.—British Thomson-Houston Co., Ltd. 25392.

Dyestuffs.—S. Coffey, D. A. Fairweather, and I.C.I., Ltd. 25196.

Dyestuffs.—S. Coffey, D. A. W. Fairweather, D. E. Hathway, and I.C.I., Ltd. 25197.

Complete Specifications Open to Public Inspection

Catalytic treatment of oils of any origin with a view to obtaining various hydrocarbons.—D. Balachowsky. July 7, 1943. 22796/46.

Concentration of organic substances.—Distillation Products, Inc. February 23, 1945. 992/46.

Curing of polymeric materials.—E. I. du Pont de Nemours & Co. February 22, 1945. 5598/46.

Production of olefinic carboxylic acids.—E. I. du Pont de Nemours & Co. February 23, 1945. 5599/46.

Manufacture of commercial polyvinylic alcohol products and the obtained products.—E. Fiorillo and A. Polgar. October 16, 1942. 15673/46.

Polymerisation of vinyl ethers.—General Aniline & Film Corporaton. February 21, 1945. 5061/46.

Production of azo dyestuff images from N-acyl-N-aryl hydrazine developers.—General Aniline & Film Corporation. February 24, 1945. 5871/46.

Photographic sensitisers and process of sensitising silver halide emulsions. Gevaert Photo-Producten N. V. February 26, 1945. 5049/46.

Vinyl halides and process of preparing the same.—B. F. Goodrich Co. November 9, 1944. 27806/45.

Spinning of yarns of acrylonitrile polymers.—Imperial Chemical Industries, Ltd. July 28, 1943. 14432-3/44.

Aqueous emulsions of waxes.—Imperial Chemical Industries, Ltd. February 21, 1945. 5444/46.

Pulverising and drying of granular materials.—International Pulverising Corporation. February 22, 1945. 2405/46.

Organic mercury compounds and process for preparing the same.—R. A. Lehman. February 16, 1945. 11207/46.

Chemical compounds and processes of preparing the same.—Merck & Co., Inc. February 22, 1945. 1884/46.

Complete Specifications Accepted

Production of glycerine and fatty esters from animal and vegetable fats and oils.—National Oil Products Co. Nov. 3, 1942. 579,767.

Manufacture of degradation products of starch and adhesives. — S. Neumann. June 28, 1944. 579,702.

Manufacture of detergent compositions.—Pennsylvania Salt Manufacturing Co. Dec. 4, 1942. 579,835.

Alkylation of aromatic hydrocarbons.—Shell Development Co. Nov. 2, 1942. 579,781.

Production of acrylic acid and its esters. —N. Short, and I.C.I., Ltd. Jan. 12, 1944. 579,855.

Process for the manufacture of thermo-setting synthetic resins by the polymerisation of alkylene oxide derivatives.—De Trey Frères Soc. Anon. June 16, 1943. 579,698.

Process for lowering the olefin content of olefin-containing hydrocarbon fractions. —Universal Oil Products Co. Aug. 24, 1942. 579,827.

Process of treating sulphidic tungsten ore concentrates.—T. J. Williams. Nov. 13, 1942. 579,743.

Grain or shaped articles of α-alumina. November 3, 1944. 580,031.

Production of iron or steel alloys containing vanadium and silicon.—Climax Molybdenum Co. March 6, 1941. 579,923.

Production of ferrous alloys containing cobalt and silicon.—Climax Molybdenum Co. March 6, 1941. 579,924.

Production of ferrous alloys containing chromium and silicon.—Climax Molybdenum Co. March 6, 1941. 579,925.

Production of ferrous alloys containing titanium and silicon.—Climax Molybdenum Co. March 6, 1941. 579,926.

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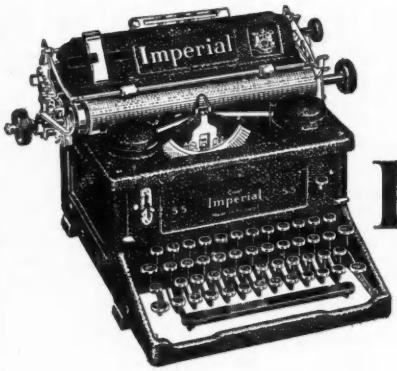

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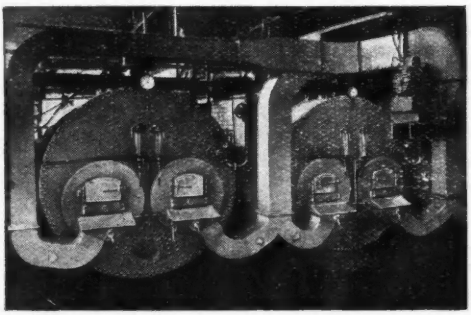

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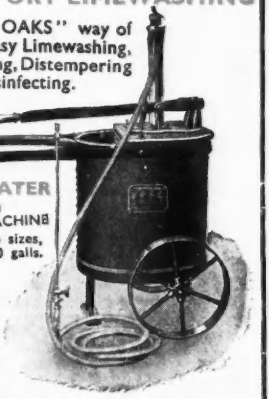

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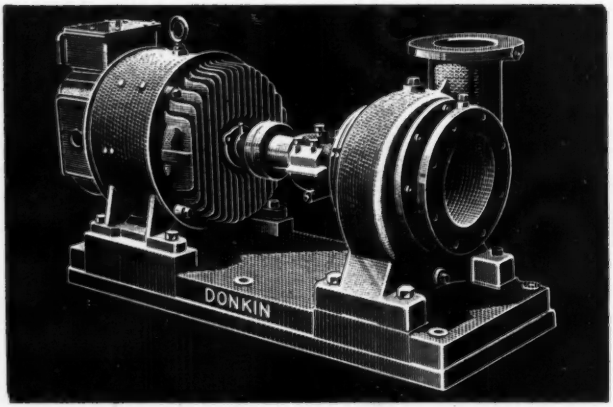

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